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The Heating and Ventilating Magazine

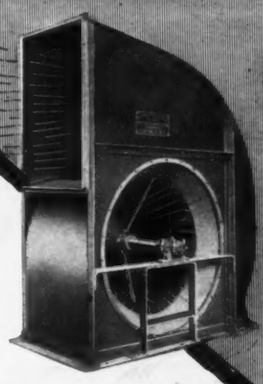
A MONTHLY JOURNAL of ENGINEERING PROGRESS

Vol. XVII. No. 3
$2.00 a year 20 cents a copy

MARCH 1920

Published at Cooperstown, N. Y.
New York Office, 1123 Broadway

FRESH AIR



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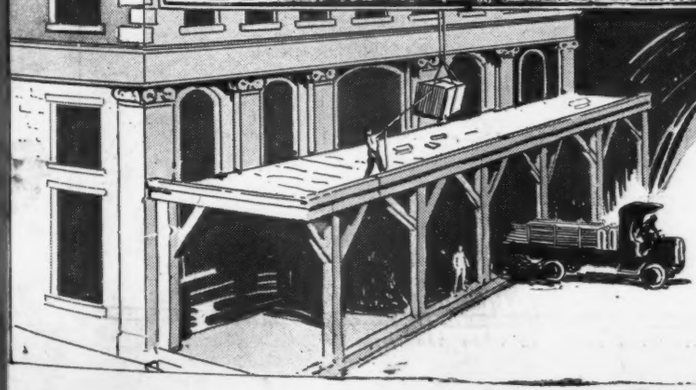

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The Heating and Ventilating Magazine
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FIG. 1—EAST SIDE HIGH SCHOOL, CINCINNATI, O.

MECHANICAL EQUIPMENT OF THE EAST SIDE HIGH SCHOOL, CINCINNATI, OHIO

Details of Installation, Showing Methods Followed in Handling Group of Buildings

By CHARLES F. JORDAN,

Chief Engineer of the Board of Education, Cincinnati, Ohio.

THE trend of modern practice in mechanical equipment on a large scale is illustrated in the installation at the new East Side High School, in Cincinnati, Ohio. This school comprises a group of seven buildings, any one of which compares favorably in size with the general run of school structures. They were designed and built in the midst of the war period so that they are fairly representative of what may now be considered post-war practice. Architecturally, they will take rank as among the most important contributions that have been made to the development of school building design.

The school is equipped with a complete heating and ventilating system, air washers and humidifiers, coil, damper and pool control, temperature regulation and vacuum cleaning system. The boiler and pumps are in a separate building.

The "split system" of heating and ventilating is used in buildings A, B, D, and E, and a fan blast in building C which contains the auditorium and dining-rooms.

BOILERS.

The boiler plant consists of five B. & W. cross-drum boilers of 250 H. P. each, set two in double batteries and one single boiler. The bottom of the front headers is 11 ft. from the floor line. Shells of drums are 1/2-in. plate and are designed to operate

at 160 lbs. pressure. The tubes are steel 4-in. in diameter and No. 9 gauge.

The boilers are stokered to give 200% rating and equipped with Westinghouse underfed type stokers with three retorts each. American Blower Co.'s fan, with dual drive, supplies air to the stokers. This drive is effected through a 50 H. P. Westinghouse motor and an American Blower Co.'s type A double-cylinder engine controlled by a McDonough damper regulator. The boilers are equipped with Ellison three-point draft gauges, connected to the fan blast, combustion chamber and uptake. Coal is dumped from storage bins into a two-wheel buggy having a capacity of one-half ton and is hoisted by elevator to the loading platform and emptied into stoker hoppers. These hoppers have a capacity sufficient for a day's run. The ash tunnel running from the elevator under the rear of the boilers is connected to the ash pits by air-tight doors. A head room of 6 ft. 6 in. is provided in the tunnel which is ventilated by a 12-in. duct running from the blast fan. This duct has a damper with handle at the floor line which is opened by the fireman before entering tunnel; this almost instantly clears the tunnel of all gases. Ashes are hoisted by elevator from the ash tunnel to the yard level, a distance of 30 ft. The feed water for the boilers is regulated by a McDonough feed-water regulator.

The stack is 150 ft. high and has an inside dimension of 80 in. x 80 in.

STEAM MAINS.

Steam is taken from each boiler through a 6-in. non-return valve into a 10 in. header. A connection for the stoker engine is taken off in boiler room; the header then continues into the engine room where there are three tees left for generating sets, thence into pump room where steam for the pumps is provided. This header now branches off into a 7-in. and an 8-in. high-pressure line. The 7-in. line runs through an underground tunnel and enters the main group of buildings at building E, continuing thence through into building A, which is the most distant.

Expansion and contraction is taken care of by double expansion joints in the tunnel and by swing joints in each of A, B, C, D and E buildings. All high-pressure lines are drained through thermostatic traps. Steam for each building is taken from the high-pressure main carrying 150 lbs. through a pressure-reducing valve which reduces the pressure to 50 lbs. when it is then taken through another pressure-reducing valve and reduced to 2 lbs. for use in buildings.

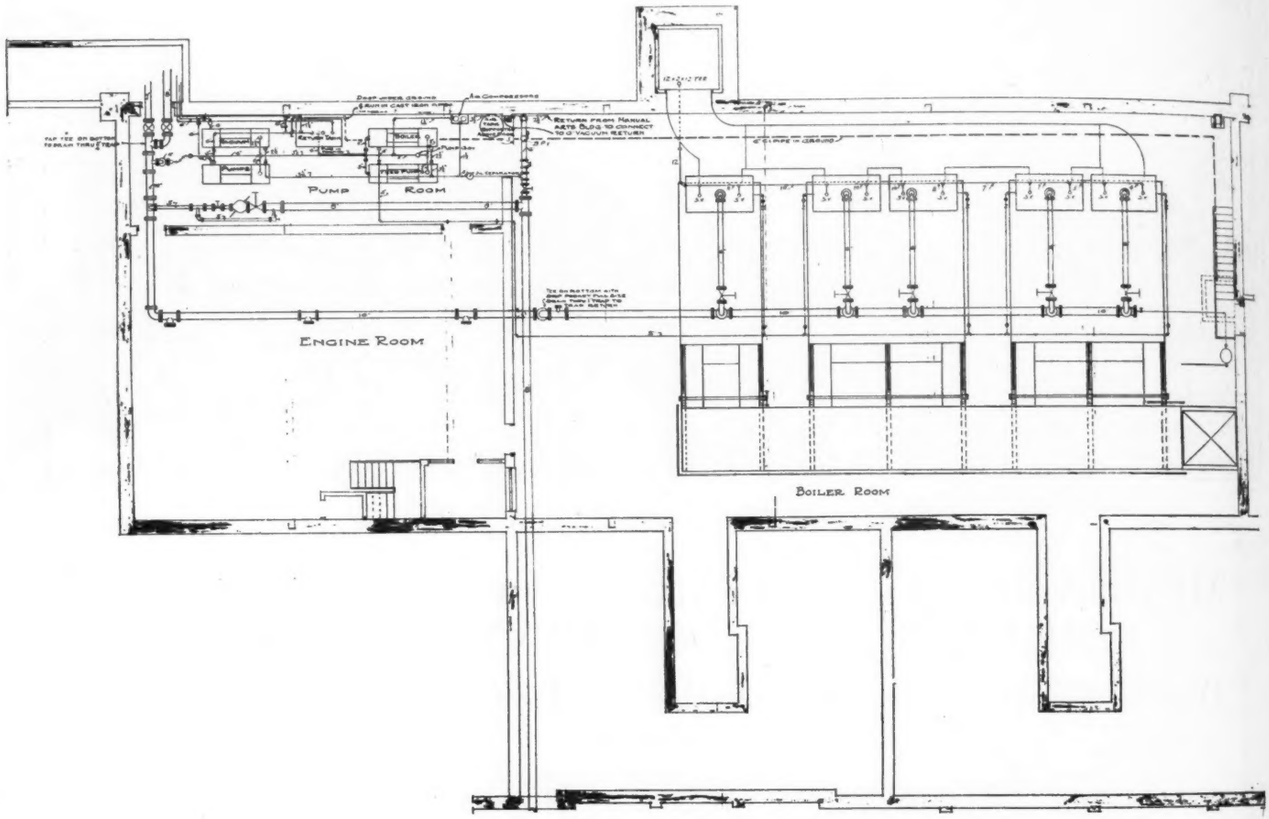


FIG. 2—PLAN OF POWER HOUSE, SCHEME NO. 1.

The 8-in. high pressure main is also carried through the tunnel into building C, and thence through another tunnel into the "Gym" building. Expansion is taken care of the same as in the 7-in. high-pressure lines. In building D a cross connection allows the use of either line for heating in case of a break down between this point and the pump room.

This 8-in. high-pressure line supplies steam for the

kitchen, plunge heaters, shower baths and laundry. Its apparent over size was made necessary primarily, because of the short period for heating pools and shower water before morning class and incidently, the possibility during the day of the thermostat control starting both pool heaters at the same time. The pools are emptied, cleaned and filled each night. This is more fully explained in the pool control later. All high-pressure work is flanged.

A number of features regarding the running of piping in tunnels connecting the various buildings are brought out in the accompanying illustrations, especially Fig. 4 which shows details of the different methods of tunnel construction used. As will be noted the piping in connection with the pool heaters and circulating pumps is so designed that in case of a failure of either heater or pump, water for either pool can be supplied by either pump through either heater; also if desired, heaters can be thrown in series for quick increase of temperature.

Condensation from the pool heater is taken care of by Crane-tilt traps discharging to the pump suction or the return tank in boiler house as desired. For heating the water for pools Kelly multitube heaters are used, each having a capacity for raising the temperature of 67,500 gal. of water, the capacity of each pool, 42° in a period of 1 1/2 hours. Goulds centrifugal pumps are used for circulating the pool water, each pump having a capacity of 45,000 gal. per hour with a head of 12 ft.

RADIATION.

The total radiation in the buildings is as follows:

Building A, 4865 sq. ft. direct, 1600 sq. ft. Vento, with an air supply of 31,600 cu. ft. per min.

Building B, 4460 sq. ft. direct, 1368 sq. ft. Vento, with an air supply of 27,000 cu. ft. per min.

Building C, 5250 sq. ft. direct, 3103 sq. ft. Vento, with an air supply of 35,000 sq. ft. and 912 sq. ft. Vento, with an air supply of 16,700 sq. ft.

Building D, 5184 sq. ft. direct, and 1444 sq. ft. Vento, with an air supply of 31,600 cu. ft.

Building E, 5691 sq. ft. direct, 2052 sq. ft. Vento, with an air supply of 39,000 cu. ft.

Industrial Arts Building, 17,605 sq. ft. direct.

Gymnasium, 9365 sq. ft. direct.

The floor radiation is of U. S. Radiator Corporation's make, while the wall radiation is of American Radiator Co.'s make.

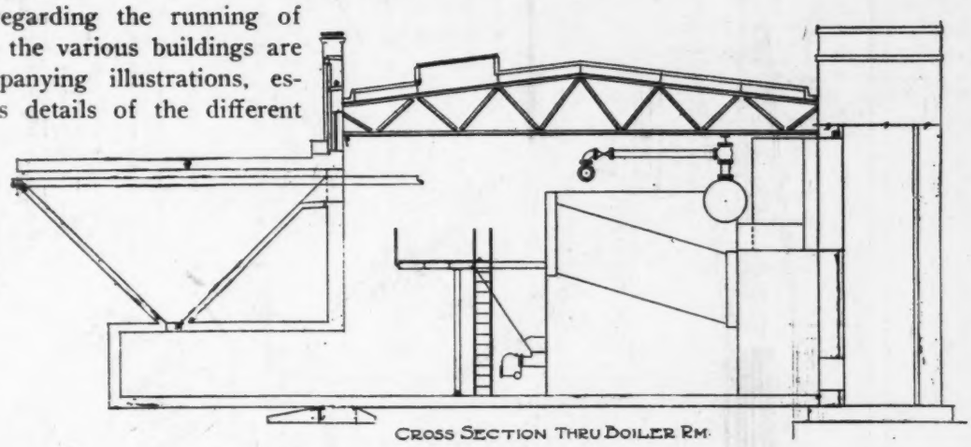


FIG. 3—CROSS SECTION THROUGH BOILER ROOM.

The Webster vacuum heating system is used, with Webster sylphon traps.

VENTILATING.

The ventilating equipment is complete for each building, as will be seen from the schedule below.

The fans are Multivane type of the B. F. Sturtevant Co.'s make, driven by Triumph Electric Co.'s type T. R. motors. Outfits Nos. 2 and 12 handle acid fumes from the laboratory hoods and are painted throughout to resist the corrosive action of these fumes. Two coats of bitumastic solution were applied with an air brush.

The mushroom system of ventilation is used for the auditorium. The motor driving the auditorium fan is of the slip-ring type controlled by a Cutler-Hammer drum-type controller which will give 40% regular speed and has six steps up to maximum speed.

As the auditorium is not in daily use the fan is only run fast enough to keep the room from becoming chilled when not occupied.

	SCHEDULE OF FANS										SCHEDULE OF MOTORS							
Outfit	Type	Size	Blast Wheel In. diam	Speed R P.M.	Delivery Cu. ft. per min.	Gauge Iron.	Pulley In.	Housing	Service	Static Press. In.	Location	H P	Volt	Phase	Cycles	RP M	Type	Pulley In.	Bltd	DC
No. 1	Des. 3	No. 11	58 7/8	209	31600	11	36x7	Full	Supply	1	Base A	10	220	3	60	850	S. C.	9x7	*	
No. 2	Steel Pl	35"	21	850	2250	11		Full	Chem. Ex.	1	Attic A	1	220	3	60	1140	S. C.			†
No. 3	Des. 3	No. 10	52 3/8	245	27000	11	31x7	Full	Supply	1	Base B	10	220	3	60	850	S. C.	9x7	*	
No. 4	Des. 2	No. 3	14 5/8	850	2900	11		Full	Exhaust	3/4	3d fl B	1	220	3	60	850	S. C			†
No. 5	Des. 3	No. 12	65 1/2	235	35000	11	48x8 3/4	Full	Supply	1 3/4	Base C	20	220	3	60	850	Sl. Rg.	13x8 3/4	*	
No. 6	Des. 3	No. 9	45 7/8	235	16700	11	29x5	Full	Supply	3/4	**	5	220	3	60	1140	S. C.	6x5	*	
No. 7	Des. 3	No. 9	45 7/8	235	16700	11	29x5	Full	Exhaust	3/4	Attic C	5	220	3	60	1140	S. C.	6x5	*	
No. 8	Des. 2	No. 4	17 1/2	850	5200	11		Full	Exhaust	1	Attic C	3	220	3	60	850	S. C.			†
No. 9	Des. 3	No. 11	58 7/8	209	31600	11	36x7	Full	Supply	1	Base D	10	220	3	60	850	S. C.	9x7	*	
No. 10	Des. 3	No. 3	16 3/8	850	3600	11		Full	Exhaust	3/4	3d fl D	1 1/2	220	3	60	850	S. C.			†
No. 11	Des. 3	No. 12	65 1/2	188	39000	11	59x8 3/4	Full	Supply	1	Base E	15	220	3	60	850	S. C.	13x8 3/4	*	
No. 12	Steel Pl.	35"	21	850	2250	11		Full	Chem. Ex.	1	Base E	1	220	3	60	1140	S. C.			†
No. 13	Des. 3	No. 6 1/2	29 1/2	418	7890	11	16x5	Full	Exhaust	1	Grls Gym	3	220	3	60	1140	S. C.	6x5	*	
No. 14	Des. 3	No. 6 1/2	29 1/2	418	7890	11	16x5	Full	Exhaust	1	Bys Gym	3	220	3	60	1140	S. C.	6x5	*	

**Space between ceiling Auditorium and Lunch Room "C." *Belted outfits. †Direct Connected outfits.

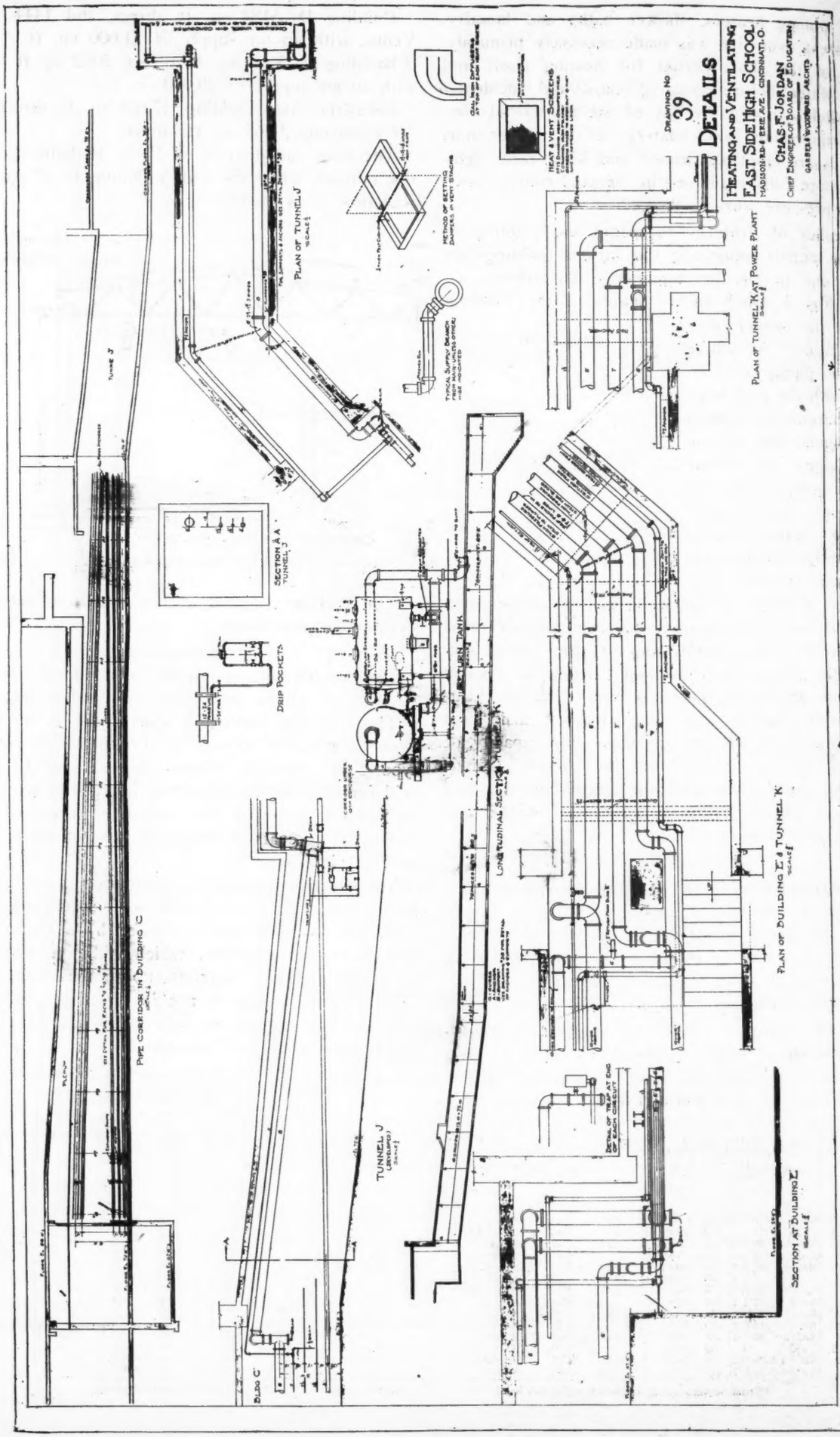


FIG. 4—PIPING DETAILS, EAST SIDE HIGH SCHOOL.

The air for the dining room in building C is introduced into the room through openings in floor beneath each radiator. This was made necessary because of lack of wall space for the usual method of delivery. The air is exhausted by a No. 9 Sturtevant multivane fan placed in the attic over the kitchen for summer ventilation as well as winter. The building requirements compelled the use of a deep concrete beam between the kitchen and dining room coming to within 8 ft. of the floor. Under this beam is placed the serving table. As all the air exhausted is drawn beneath this beam its movement serves to prevent any odors from the kitchen or serving table finding their way into the dining room.

The Vento heater schedule is as follows:

VENTO SCHEDULE

Location	Stacks	Height In.	Sections	Regular	Centers In.	Square feet Heating surface	Free Area Square Feet
Basement A	4	72	21	"	5⅜	1600	27.25
Basement B	4	72	18	"	5⅜	1368	23.34
Basement C	8	60	14	"	5⅜	1792	15.15
Basement C	3	72	23	"	5⅜	1311	29.80
Lunch Room C	4	72	12	"	5⅜	912	15.60
Basement D	4	72	19	"	5⅜	1444	24.64
Basement E	4	72	27	"	5⅜	2052	35.13

AIR VELOCITIES USED.

The following air velocities are used throughout:

Vento coils, 1000 ft. per minute.
Air washers, 500 ft. per minute.

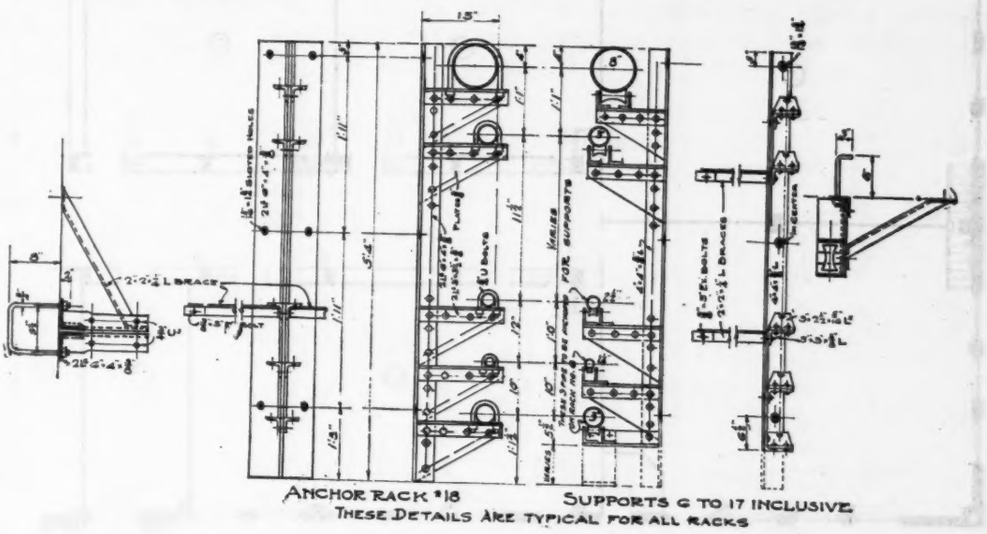


FIG. 5—TYPICAL, ANCHOR RACK.

Trunk ducts, 1000 ft. per minute.
Laterals, 750 ft. per minute.
Risers, 500 ft. per minute.
Heat outlets, 250 ft. per minute.

AIR WASHERS AND HUMIDIFIERS.

All the air is washed and humidified by Webster Type A air washers with the following capacities:

Building A—27,000 cu. ft. per minute.
Building B—24,000 cu. ft. per minute.
Building C—30,000 cu. ft. per minute.

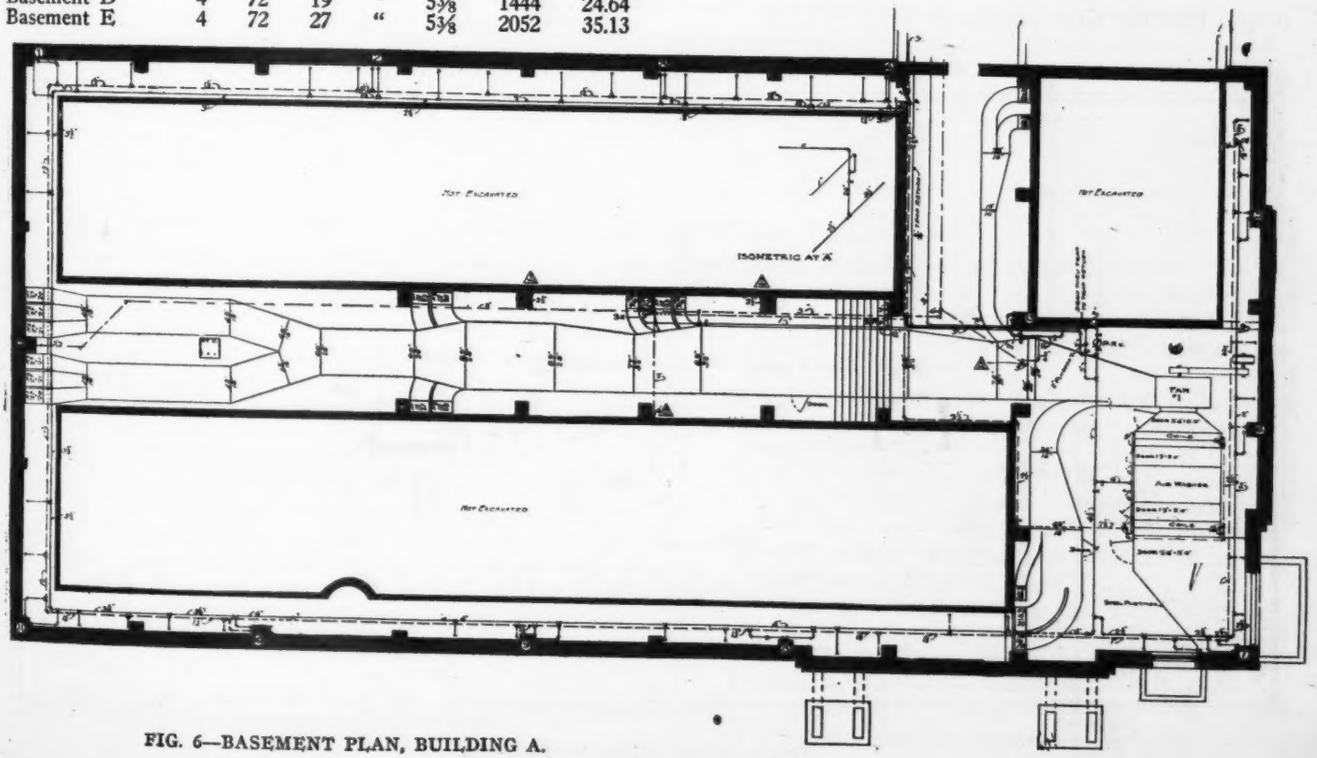


FIG. 6—BASEMENT PLAN, BUILDING A.

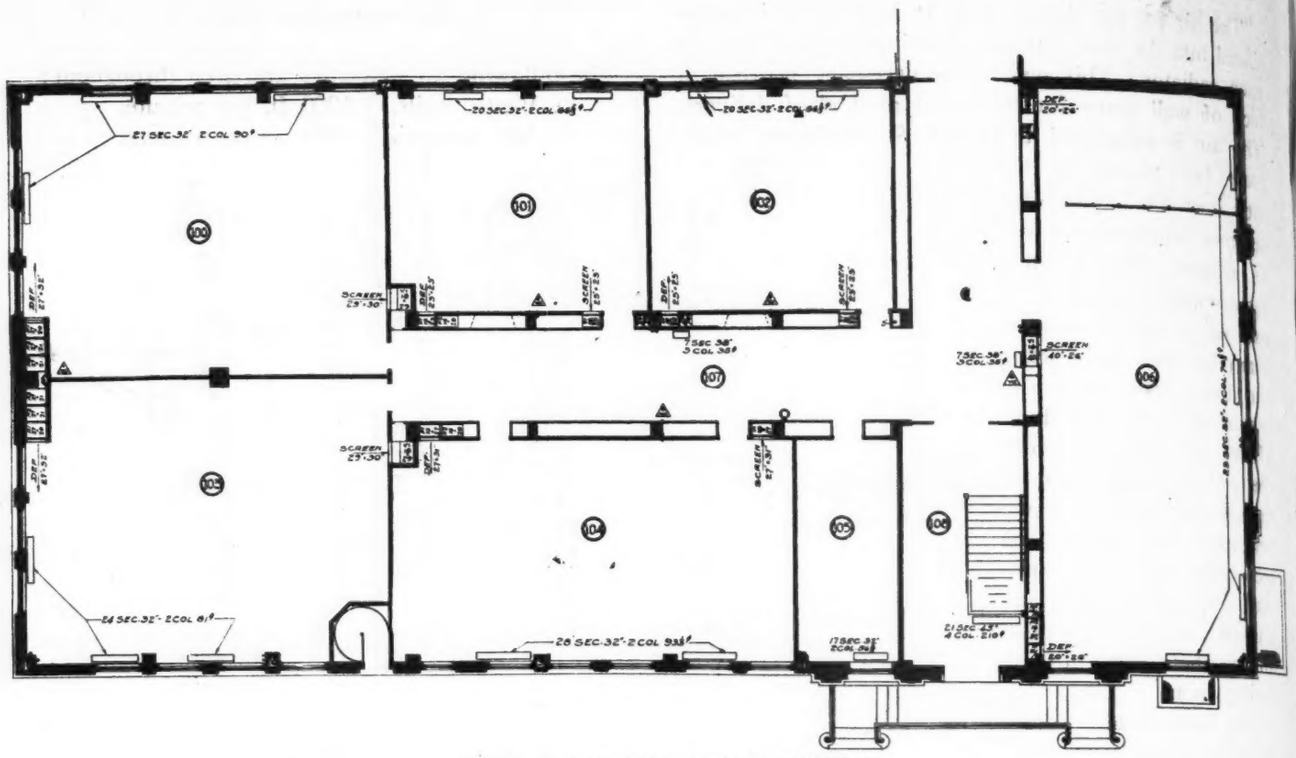


FIG. 7—FIRST FLOOR PLAN, BUILDING A.

Building D—25,000 cu. ft. per minute.
Building E—35,000 cu. ft. per minute.

The eliminators or faces of washer are of practically the same width and height as the heating coils, and are centered on same thus giving the air a straight course through coils and washer.

These washers are placed on a foundation 2 ft. high making priming of pumps unnecessary. The pumps are from the Platt Iron Works and driven by Triumph Electric Co.'s motors.

PUMPS.

The boiler feed pumps are of Worthington make and consist of two duplex units, 10-in. x 6-in x 10-in. each. From these boiler feed pumps a 5-in. line branches off into a 2-in. to each boiler. The vacuum pumps, two in number, are 12-in. x 16-in. x 16-in., of Worthington make.

VACUUM CLEANING.

Two complete vacuum cleaning systems are installed,

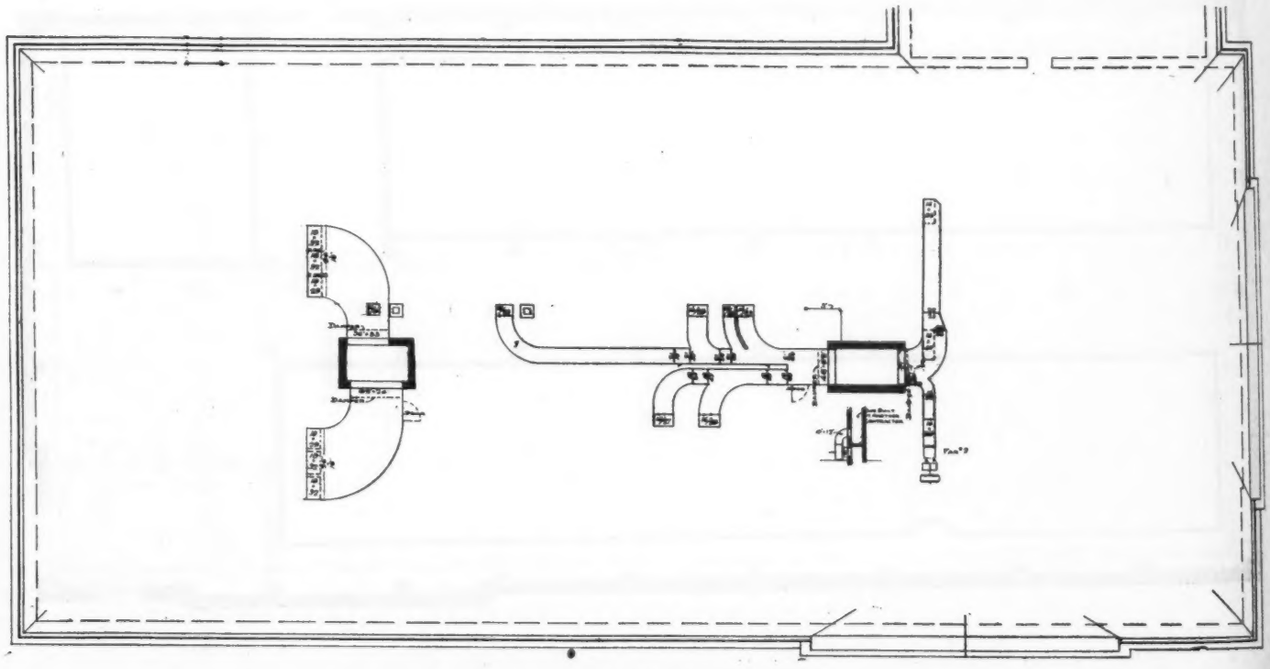


FIG. 8—ATTIC PLAN, BUILDING A.

taking care of Buildings A, B, C, D, E and the Gymnasium Building. They are of the Spencer Turbine Co.'s make, horizontal type, operating at 1750 R. P. M. One system is located in the storage room of the gymnasium, of four-sweeper capacity, taking care of that building. The other in the basement of Building D, takes care of Buildings A, B. C. D and E consists of one large separating tank and two machines connected thereto. Each machine in Building D is known as a six-sweeper plant. The machines in Building D are automatically controlled so that when one machine is in use and the vacuum falls to a predetermined point, the other machine will start automatically. The two exhausters used have a normal capacity of six sweepers each and are capable of producing a vacuum of 6 in. of murcury.

(To be continued.)

PLAN AND SPECIFICATION DATA SHEETS FOR HEATING AND VENTILATING

Forms Suitable for Use in Preliminary Work Prior to the Design of the Installation Itself

III.

(Continued from February issue.)

(Every item not marked "x" must be shown on plans.)

GENERAL MATERIALS. (Ten.)

Valves.

Show valves on radiator, run-outs (when possible), coils, indirect stacks, fan heaters, accelerating coils, riser returns, drips, etc. Also on boilers, engines, pumps, at reducing valves, in building connections, and wherever else required.

Valves in feed piping. (On each side of check in boilers of over 50 H. P. set in battery.)

Valves and cocks in blow-off piping. (Two on each connection for H. P. work).

All outlets from boilers 2-in. and over must have O. S. and Y. valves.

Check valves:
- On each main return.
- On each feed connection.
- On each cold water connection.
- On each trap discharge.
- Elsewhere as required.

"x" Air valves: See line 62 preliminary sheets.

"x" Air valves (not to be shown) with or without drip piping?

"x" Where shall drip piping be discharged? ———

Main air vents:
- How many? ———Where placed? ———

Reducing valves:
- Number reducing valves (numerically)———
- Size ———in. x ———in. By-pass ——— in.

"x" To reduce from ———to———lbs.

Back pressure valve:
- Size ———in. Where located ———

Traps.

Size of each trap:

Give standard detail drawing showing connections ———

See that only the same pressures go to one trap. Properly valve each trap.

Water-seal Traps.

Where located ——— Size ———in.
Size balance pipe ———in.

Expansion Joints.

To be used where ———

Expansion Tank.

Locate on plans. Size expansion pipe ———in.

Heat Generator.

Locate on plans. No. ——— Size expansion pipe ———in.

Supports and Anchors.

Give details so far as possible (especially of anchors)

"x" Kind of packing ———

RADIATION. (Eleven.)

See lines 58 to 64 on preliminary sheets.

General instructions for all radiators and coils:
- Show kind, number of columns, square feet, height and connections of each radiator on the plans.
- See that radiators do not interfere with windows, shutters, doors, closets, passage-ways, blackboards.
- Keep them below window sills.
- Use wall radiators on stair landings when possible, and keep radiators out of line of travel.
- See that lowest radiator is at least 18 in. above water line. (Indirect 24 in.)

Direct:
- Number of columns ———
- Style ———
- Height ———

Wall:
- Number of section ———

Sq. ft. per section ————————
How built up ————————
Direct-Indirect:
Style (Usually Italian flue) "x" "x" ————
Style of cold air connection and W. P. boxes ————————
Divided:
Style ————————
Where used ————————
Wall and ceiling coils:
Where used ————————
Number, size and length of pipe ————
Indirect: (Includes reheater coils.)
Pattern ————————Y————
Sq. ft. per section ————————
Height of section ————————
Accelerating heaters:
Connected to separate mains? ————
Kind ————————
Air valves on same drip to ————————
Place the accelerating coil in each vent flue near room opening wherever possible.

RADIATOR FINISH. (Twelve.)

See line 61 preliminary sheets.
"x" How are radiators to be finished ————
(State number of coats, etc.)

PIPING. (Thirteen.)

Use standard key for showing piping.
Show L. P. and H. P. steam, return and drip pipes, feed pipes, water pipes, blow-off pipes, vapor pipes, balancing pipes, etc.
Give size of all pipes.
See that all piping is at least 18 in. above water-line.
Look out for stairways, wells, landings, windows, doors, transoms, girders, etc., in running pipes.
Keep pipes out of vegetable and similar rooms.
Provide for expansion with offsets and swing joints.
Never use 1-in. pipe in supply on one-pipe work, or where water and steam run in opposite directions.
If siphon drips are used, use 3/4-in. on risers up to 2-in., and 1-in. above.
Do not use siphon drips on wet return systems.
On pipes buried under floors show tile, covering and drawoff.
See that steam and return mains are valved alike, with check valve on returns.
Make water and steam balance pipes large.
Provide steam connections to laundry, kitchen, etc.
Make riser sheet.
Size of expansion pipe from heat generator ————in.
"x" Use "Standard" fittings in ————————
"x" Use E. H. fittings in ————————
"x" Use E. H. pipe in ————————
Use galvanized iron pipe and fittings in ————
Use brass pipe and fittings in ————————
"x" Polished pipe and fittings in ————————
Boiler piping:
Size main hot feed pipe ————————in.
Size branch to each boiler ————————in.
Flue blower connection between each pair boilers ————————in.
Main drum ————————in.
Run-outs to same ————————in.
Bal. drum ————————in.
Run-outs to same ————————in.

Water and blow-off connections: See lines 65 and 66 preliminary sheets.
Show where cold water and blow--off connections are to be made.
Boilers of over 50 H. P. requiring mechanical means of feeding must be provided with duplicate apparatus.
The temperature of the usual feed water must be at least 120° where the pressure exceeds 25 lbs.
Minimum size blow-off allowed, 1-in.; maximum, 2 1/2 in.,
Size main cold-water pipe ————————in.
Size branch cold-water pipe ————————in.
Size main blow-off connection to boiler————in.
Size main blow-off pipe ————————
Outlet for cold water in ————————
Size of boiler blow-off ————————in.
Engine Piping:
Size engines ————————in.
Size supplies ————————in.
Size exhausts ————————in.
Size cylinder relief drips ————————in.
Size steam chest drips ————————
Size drip from each separator ————————
Size main drip from sand ————————
Size drip from extractor ————————
Size discharge same into ————————
Size drip exhaust head to ————————
Size drip exhaust riser to ————————
Size exhaust riser above B. P. V. to ————
Piping pumps:
For number of pumps see page ————————
Size suction connection ————————in.
Discharge ————————in.
"x" Drain receiver to ————————
Show gate valve in suction to each pump ————————in.
Size cold water connection to receiver ————in.
Show automatic steam valve and by-pass to same ————————
Show 2-in. vapor pipe to ————————
Show 2-in. balance pipe.
Exhaust connects back of extractor and B. P. valve.
Piping elevator pumps:
Number and size ————————
Size steam connections ————————in.
Size exhaust connections ————————
Drip connections ————————
Show governors and air pumps.
Risers: See lines 67 and 68 preliminary sheets.
Are risers to be exposed or concealed ————
See that run-outs can be run as shown. If over 5 ft. long make one size larger than radiator connections. Do not let risers or run-outs run through cornices, coves or plasters.
Drips:
See that mains are sufficiently dripped.
Riser drips, plain or siphon ————————
Size of riser drips ————————
Heating mains, how dripped ————————in.
Draw-off connections from returns in ————
Boiler drums, how dripped ————————
Size branch drips ————————in.
Main drip ————————in.
Connecting to ————————
Auxiliary mains: See lines 45, 46.
Is there to be a separate system ————————
If so, to include what ————————

Should include accelerating coils, hot-water tank, etc.
Conduit piping:
Make detail drawings of piping in pits, showing anchors, valves, supports, expansions, etc.
See lines 72 and 73 preliminary sheets.
Locate thermostats on plans.
Apply control to the following rooms ————
Give list of rooms with number of thermostats, valves and dampers, with sizes, in specifications.
Apply to direct radiation————; indirect radiation————; fan coils————; or dampers? ————
How many compressors and kind? ————
Locate tank in ————

PIPE COVERING. (Fifteen.)
Kind of covering ————
Pipes covered where ————
Kind of covering on fittings ————
Cover flanges where ————
Extra thickness sectional covering where ————
Risers covered where ————
Are domestic H. W. pipes to be covered ————
Are cold water pipes to be covered ————
Smoke pipes, uptakes and overhand ————
Boiler tops ————
Sectional boilers ————
Feed-water heaters ————
Water boiler ————
Pump receiver ————
Separators and extractor ————
Covering in tunnels ————
Ducts and stacks ————
Concealed hot air flues ————
Brine piping ————
Extra canvas jacket ————
Painting covering ————
Fireproof non-conducting ceiling ————

(*To be concluded in April issue.*)

NEW DATA ON HEAT LOSSES FROM RADIATORS

With Values for Different Sizes and Shapes of Radiators, Based on Radiant Heat Loss Tests.

NEW data on the heating effect of radiators of different types and sizes, in which a study was made of the comparative amounts of radiant and convected heat given off, are contained in an important paper presented by Director John R. Allen and Frank B. Rowley at the recent annual meeting of the American Society of Heating and Ventilating Engineers. The data were based on a series of tests conducted at the University of Minnesota.

Probably the most important result of the investigation was the preparation of tables showing the proper selection to be made of radiators for any given class of work, taking into consideration the items of height, width and length and number of columns, as well as whether radiant heat or convected heat is mostly desired. (These tables were presented in a supplementary paper by Professor Allen, entitled, "Heat Loss from Direct Radiators").

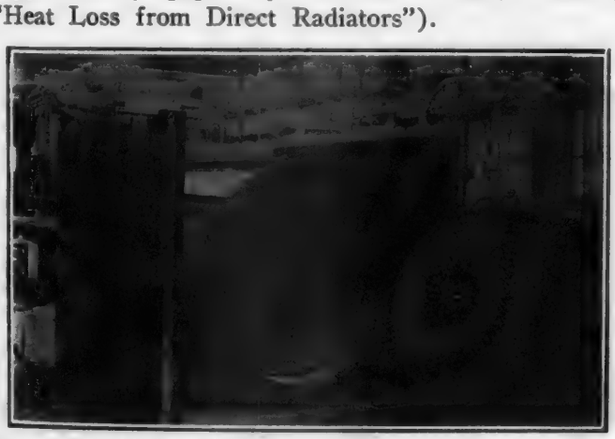


FIG. 1—METAL TANK USED IN EXPERIMENTS TO MEASURE RADIANT HEAT GIVEN OFF BY RADIATOR.

A novel method was adopted for measuring the radiant heat given off by a radiator. As the author explained, convected heat is that absorbed by the air passing along the surface of the radiator. It was, therefore, determined that if the radiator could be placed in a vacuum, the heat emitted would necessarily be radiant heat.

A metal tank was provided, as shown in Fig. 1 and the air was exhausted by means of a water ejector. Almost a complete vacuum was obtained. Steam was supplied to the radiator from an electrically heated boiler, all condensation being returned to the boiler. The difference between the total output and the constant boiler loss was taken as the heat given off by the radiator.

Four series of tests were made:

1. Using a plain cast-iron radiator, with rusty surface.
2. Surface covered with aluminum paint.
3. Surface painted black.
4. Plain cast-iron surface, not rusted.

The results of these tests are shown in Fig. 2. Incidentally, it was found that the radiation coefficients corresponded very closely with those given in Stefan and Boltzmann's law, the actual test figures being as follows:

Cast-iron, rusty, 0.142; cast-iron, painted black, 0.130; cast-iron, clean, 0.148; with aluminum paint, 0.104; physical experiment, clean cast-iron, 0.157.

In computing the radiant heat loss from a radiator the author stated that it was sufficiently accurate to assume the value obtained from physical experiments,

namely, 0.157 for cast-iron. If this value was assumed, with a steam temperature of 215° F. the heat lost by radiation is approximately 200 B. T. U. per square foot of rated surface.

USE OF K DISCARDED AS A CONSTANT.

From the study made of the comparative amounts of heat given off by radiation and by convection, Director Allen stated that he was forced to discard the constant K which he characterized as the only variable in the equation. A study of the various forms of radiators is given in Table 1 which shows the proportion of radiant heat to convected heat in the various types. It will be noticed that in wall coils, about one-half of the heat is given off by radiation and one-half by convection while in a 4-col. radiator about 70% is given off by convection and 30% by radiation. It is apparent from this table that all radiators do not give exactly the same effects in heating a room and that the effect of heating a room with pipe coils might be called heating with radiant heat, while heating a room with 4-col. radiation might be called heating with convected heat.

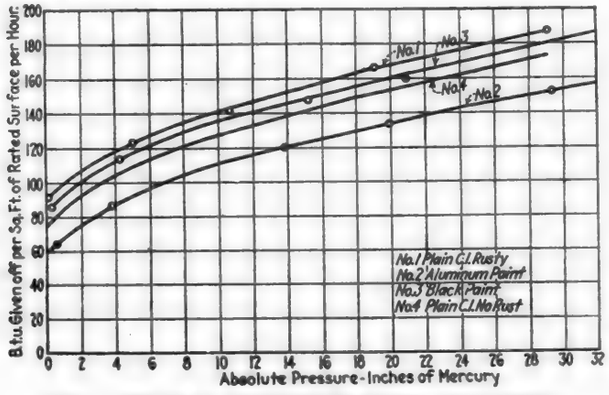


FIG. 2—RESULTS OF RADIANT HEAT LOSS TESTS.

It is, therefore, necessary in deriving an expression for heat transmission to have terms in the expression representing both radiation and convection. It will not be possible to combine these two terms as the surface radiating heat is not the same as the surface giving off the convected heat.

At the conclusion of the paper Director Allen gave a formula covering the items of both radiant and convected heat which, reduced to its simplest terms, became:

$$Q = 0.157R\left(\left(\frac{T_s}{100}\right)^4 - \left(\frac{T_r}{100}\right)^4\right) + (t_s - t_r)$$

in which Q = B. T. U. lost per square foot per hour,
R = ratio of radiating surface to the rated surface.
T_r = absolute temperature of the surrounding objects assumed to be the temperature of the room.
T_s = absolute temperature of the radiator body assumed to be the temperature of the steam.

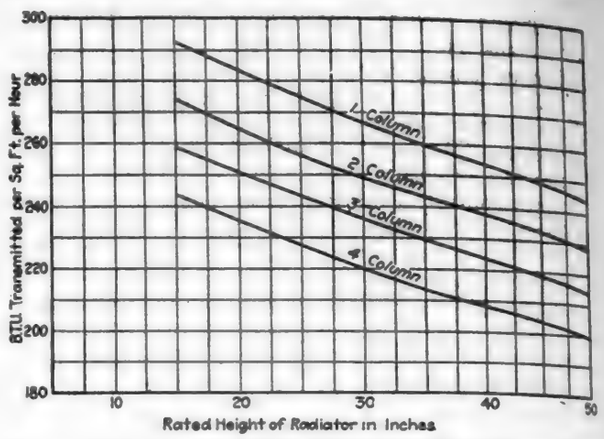


FIG. 3—HEAT TRANSMISSION FOR DIFFERENT HEIGHTS AND NUMBERS OF COLUMNS OF RADIATORS.

t_s = temperature of the steam in the radiator, deg. F.
t_r = temperature of the air in the room, deg. F.

TABLE 1. B. T. U. TRANSMITTED PER SQUARE FOOT OF RADIATOR PER HOUR FOR DIFFERENT HEIGHTS AND NUMBER OF COLUMNS.

Steam Temperature 215° F.
Room Temperature 70° F.
10 Sections of Radiator.

Height of Radiator	1-Col.	2-Col.	3-Col.	4-Col.
45		233	218	204
38	256	240	226	210
32	265	247	234	218
26	273	255	242	226
23	278	260		
22			248	232
20	283	265		
18			254	238

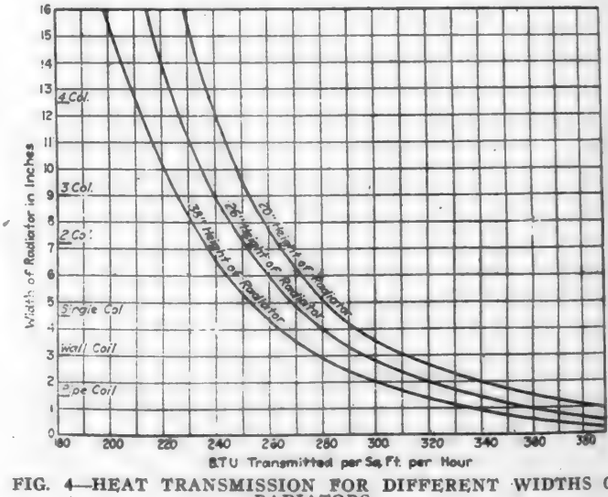


FIG. 4—HEAT TRANSMISSION FOR DIFFERENT WIDTHS OF RADIATORS.

TABLE 2. HEAT TRANSMISSION FOR DIFFERENT WIDTHS OF RADIATOR EXPRESSED IN INCHES.

Steam at 215° F.
Room at 70° F.
10 Sections of Radiator

Width of Radiator Inches	Height of Radiator 20 in.	26 in.	38 in.	Width corresponds with
3	310	297	288	Wall Coil
4½	287	274	258	Single Column

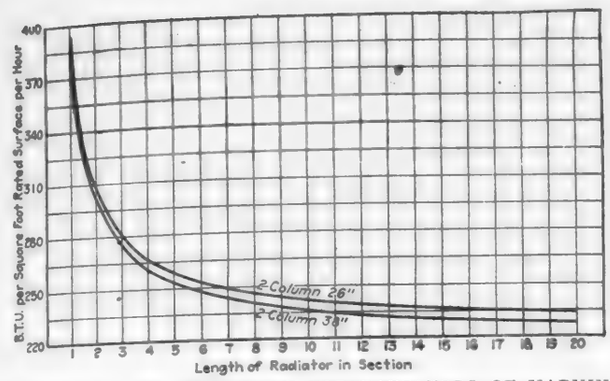


FIG. 5—HEAT TRANSMISSION FOR RADIATORS OF VARYING LENGTHS.

7⅛	264	251	236	Two Column
9	253	240	226	Three Column
12½	239	225	211	Four Column

TABLE 3. HEAT TRANSMISSION FOR RADIATORS OF VARYING LENGTHS

Steam at 215 deg. fahr.
Room at 70 deg. fahr.

Length of Radiator In Sections	Height of Radiator 38 in.	32 in.	26 in.	23 in.
1	387.8	389.0	393.7	391.6
2	302.4	304.0	305.8	308.4
3	274.0	275.8	280.0	282.3
4	260.6	263.3	265.8	269.2
5	252.6	254.0	257.8	259.6
6	247.0	249.2	253.3	254.7
7	242.8	244.9	248.5	251.2
8	240.0	241.7	245.7	248.5
9	237.8	239.8	243.4	246.5
10	235.8	237.8	241.6	244.8
11	234.4	236.4	239.6	243.1
12	233.0	235.2	239.1	242.0
13	232.1	234.2	238.0	240.5
14	231.2	233.6	237.1	239.5
15	230.4	232.6	236.2	238.7
16	229.7	232.0	235.6	237.9
17	229.1	231.1	235.1	237.2

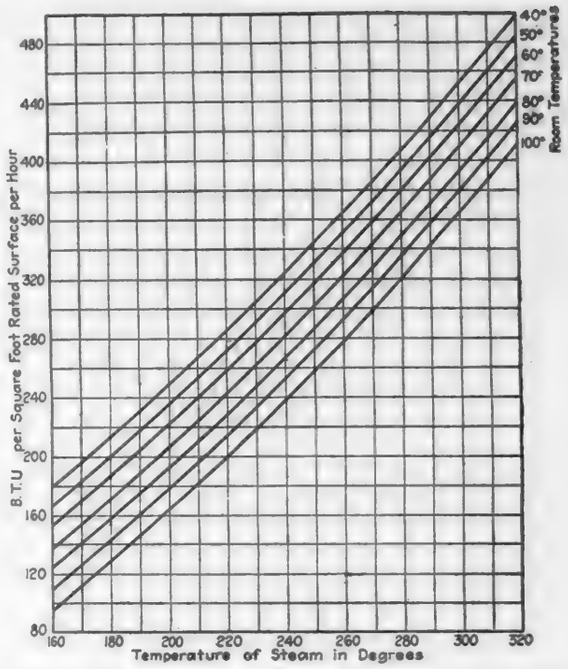


FIG. 6—HEAT TRANSMISSION FOR VARIOUS TEMPERATURES OF STEAM IN RADIATOR AND AIR IN THE ROOM

18	228.5	230.6	234.6	237.0
19	228.0	230.2	234.0	236.5
20	227.6	229.7	233.6	235.9

TABLE 4. HEAT TRANSMISSION FOR VARIOUS TEMPERATURES OF STEAM IN RADIATOR AND AIR IN THE ROOM.

Temp. of Steam Deg. F.	Temperature of Air in Room, Deg. F. 40	50	60	70	80	90	100
160	180	166.4	153.2	138.43	124.2	109.7	94.8
180	213	199.4	186.3	171.40	157.2	142.7	127.8
200	250	236.0	223.2	208.1	194.0	179.6	164.7
220	286.8	273.0	260.1	245.1	231.0	216.5	201.6
240	324.2	311.0	298.5	284.0	269.4	254.9	240.0
260	364.0	351.4	338.3	323.4	309.2	294.7	279.8
280	407.4	393.8	380.0	365.8	351.6	337.1	322.3
300	451.4	437.8	424.7	409.8	395.8	381.1	366.2

The use of the formula was shown by assuming an example with a 2-col. radiator, 38 in. high with 10 sections, steam temperature being 215°, and room temperature, 70°.

$R = 0.458$ then:

$$Q = 0.157 \times 0.458 \left(\left(\frac{675}{100}\right)^4 - \left(\frac{538}{100}\right)^4 \right) + (215 - 70) =$$

$0.072\ (2075 - 784) + 145 = 93 + 145 = 238$ B. T. U. per square foot per hour.

The actual figure taken from experiment is 240 which gives a difference of less than 1% between computed and the measured results.

Constant K. The usual expression for heat loss from a radiator is:

$$Q = K\ (t_s - t_r)$$

where K is a constant depending upon experiment.

This expression Professor Allen held, has a very limited application since t_r is usually 70, t_s, usually from 215 to 225 and the most variable quantity in the expression is the constant K. Comparing the usual

TABLE 5. RELATION BETWEEN RADIATED AND CONVERTED HEAT IN DIFFERENT TYPES OF RADIATORS.

Room at 70 deg. fahr.
Steam at 215 deg. fahr.
10 Sections in length.

Number of Columns	Height of Radiator	10 Section Rated Surface Sq. Ft.	10 Section Area of Enclosi'g Envelope Sq. Ft.	R Ratio of Radiati'g to Total Surface	Radiated Heat per Sq. Ft. Rated Surface B. T. U.	Total Heat per Sq. Ft. Rated Surface B. T. U.	Convected Heat per Sq. Ft. Rated Surface B. T. U.	Per Cent. Convected Heat to Total Heat
One	38	30	15.9	0.53	106	256	150	58.6
"	32	25	13.5	0.54	108	266	158	59.4
"	26	20	11.1	0.555	111	273	162	59.4
"	23	16 2/3	9.9	0.595	119	279	160	57.4
"	20	15	8.75	0.584	117	283	166	58.7
Two	45	50	21.45	0.43	86	234	148	63
"	38	40	18.35	0.458	92	240	148	62
"	32	33 1/3	15.65	0.47	94	248	154	62
"	26	26 2/3	14.00	0.53	106	255	149	58
"	23	23 1/3	12.70	0.544	109	260	151	58
"	20	20	11.20	0.56	112	265	153	58
Three	45	60	22.90	0.382	76	218	142	65
"	38	50	19.7	0.394	79	226	147	65
"	32	45	16.85	0.375	75	233	158	68
"	26	37½	14.10	0.376	75	241	166	69
"	22	30	12.20	0.407	82	248	166	67
"	18	22½	10.35	0.46	92	254	162	64
Four	45	100	28.05	0.28	56	205	149	73
"	38	80	24.16	0.30	60	210	150	71.5
"	32	65	21.52	0.331	66	217	151	69.5
"	26	50	17.5	0.35	70	225	155	69
"	22	40	15.27	0.382	76	232	156	67
"	18	30	13.05	0.435	87	238	151	63.5
Wall Coil		5 Section						
5A	13 5/16	25	21.34	0.854	171	323	152	47
7A	21 7/8	35	27.24	0.78	156	310	154	49.7
9A	29 1/16	45	35.32	0.784	157	295	138	48

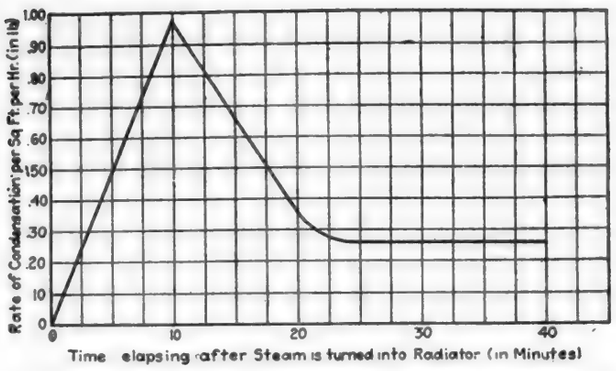


FIG. 7—RATE OF CONDENSATION WHEN STEAM IS TURNED INTO RADIATOR.

equation with the one proposed, it is quite apparent that K must have a different value for every value of R. As R changes for every type of radiator, K must change. Also K will vary with every different

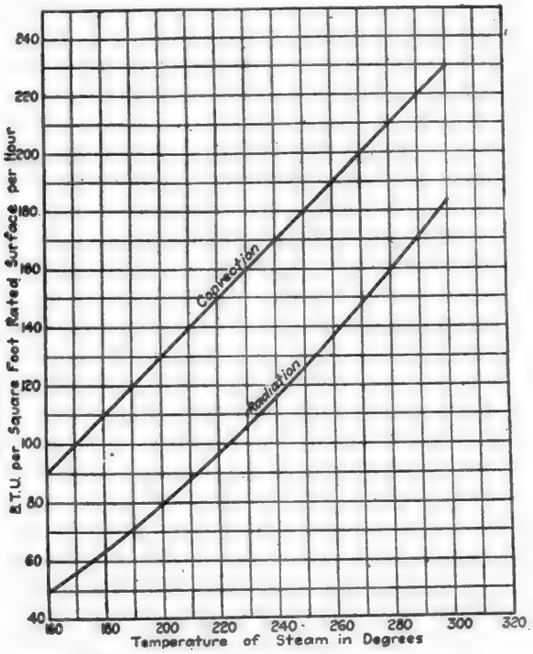


FIG. 8—HEAT TRANSMISSION BY RADIATION AND CONVECTION.

value of T_s and T_r. It is therefore apparent that the first equation will have a much wider application than would be possible with the commonly-used equation which was originally deduced for a single horizontal pipe.

Division of Air Conditions Control Established in Chicago.

Dr. John Dill Robertson, health commissioner of Chicago, has secured the establishment of the first Division of Air Conditions Control in any municipality in this country, at least, and probably in the world. The division is a consolidation of the Ventilation Division, previously existing in the Department of Health under the direction of Dr. E. Vernon Hill, with the old Department of Smoke Inspection. The new division, therefore, will have control of air conditions both inside and outside of all buildings, embracing the possibilities, at least, of giving the citizens of Chicago a clean air supply.

Not only will the new division exercise control over the ventilation of public buildings, factories, etc., but enforcement of the new temperature requirements will also be assigned to this division. A new ordinance has been drafted by Dr. Hill and sent to the council setting forth certain requirements as to the temperatures to be maintained not only in apartment buildings, but in factories and workshops as well. This also is the first ordinance in which recognition is given to the importance of the wet-bulb temperature as a factor in comfort.

TEMPERATURE ORDINANCE PROPOSED BY DR. HILL.

The proposed ordinance states that it shall be the duty of every person, firm or corporation which is under contract to heat a building, occupied either as a home, business establishment or factory, in Chicago, to maintain at least 68° F. in all rooms at all times. To determine the temperature, readings are to be made not less than 4 ft. nor more than 6 ft. above the floor. The term "at all times" includes the time between 6 a. m. and 10 p. m. in residences and, otherwise, during the usual working hours.

An exception is made where manufacturing processes require more than or less than 68° F. In such cases, the moisture content of the air must be increased for temperatures below 68° and decreased where the temperature is maintained above 68°, in the proper amount to maintain a wet-bulb temperature between 54° and 58° F. The only exception to this is in connection with special manufacturing processes.

The proposed ordinance also has a clause stating that in every building where it is proposed to install heating, ventilating or air conditioning equipment, the owner, architect or owner shall prepare plans which must be submitted to the Commissioner of Health for his approval.

The penalties for violating any of the provisions range from $25.00 to $200.00

SCOPE OF NEW DIVISION.

The establishment of the new Division of Air Conditions Control became effective at the beginning of the year. The full list of its duties is: the inspection and control of the installation and maintenance of heating and ventilating equipment, the inspection of rooms for natural and mechanical ventilation, the prevention and abatement of smoke, gas and fume nuisances, the examination and approval of plans of all heating and ventilating installations, and of all smoke, gas and fume creating prevention and abatement installations installed or reconstructed in any building, location, or on any premises within the jurisdiction of the City of Chicago.

The head of the division is to be "an engineer qualified by technical training in the theory and practice of heating, ventilation and air conditioning. He shall also be experienced in and thoroughly familiar with the design, construction and operation of steam boilers and furnaces and in the theory and practice of smoke prevention and abatement."

Under the ordinance as passed, all plans and specifications for both new and reconstructed plants for producing power and heat, must be approved by the commissioner of Health, and a permit issued by him for such erection. It is necessary to show the amount of heating to be done by such plant and all appurtenances, including the provisions for securing complete combustion of the fuel. It must also be stated what kind of fuel is to be used. The temperature in the quarters containing the steam plant must not rise above 120° F., while the air must be changed every 10 min.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

FUEL OIL, DEHYDRATION, AND OZONE IN VENTILATION THE PRINCIPAL TOPICS AT ANNUAL MEETING OF HEATING ENGINEERS

SHOWING every evidence of the advanced place the heating profession has won for itself in the engineering world, members of the American Society of Heating and Ventilating Engineers from all parts of the country gathered in New York, January 27-29, to attend the society's twenty-sixth anuual meeting. Not only was the registration larger than at any previous meeting, but the program was unusually full, including papers and discussions on such timely topics as fuel-oil, dehydration, as well as ozone.

While it was too early to expect definite reports on the work of the society's Research Bureau in Pittsburgh, one paper was presented that may be considered the first fruits of the bureau, having been prepared by Professor John R. Allen in his capacity as director of the bureau. It was on the subject of heat losses from direct radiation and, in its practical features, was easily one of the most important papers of the meeting.

Fuel-oil as a substitute for coal was thoroughly discussed in a special fuel session. Whatever the merits of fuel-oil, it was made clear that at the present time the most careful consideration should be given to any proposed substitution, especially as the oil companies are not now prepared to make long-term contracts for the delivery of fuel-oil. This factor, coupled with the New York City restrictions regarding the storage and use of fuel-oil, together with the expense of the installations themselves, left the impression that the present furor over fuel-oil needed the restraining influence of engineering advice before being taken up on a wide scale. At the same time, many indications were presented that the future holds some promising possibilities in the substitution of fuel-oil for coal.

The progress made in the field of dehydration was discussed at a Drying Session, which was notable chiefly for bringing out the practical difficulties in storing and utilizing dried fruits and vegetables on a large scale, even though the processes themselves have been fairly well developed.

The use of ozone in ventilation was again given a prominent place through some new experiences reported in connection with its use in the St. Louis public schools.

Opening Session.

The meeting opened Tuesday afternoon, January 27, in the Engineering Societies Building, with President Walter S. Timmis in the chair. Mr. Timmis delivered the president's address, the principal portions of which are presented herewith:

PRESIDENT'S ADDRESS.

Mr. Timmis designated the year just closed as the first of the reconstruction years. From a state of feverish war preparation we were suddenly confronted with the problems of resumption of peaceful activity. Building for normal occupancy had ceased by legislative control of material and labor. The trend of prices was clouded in uncertainty—some expected large price reductions, some predicted higher prices, while others were disposed to wait. Stagnation of industry was the result. Several manufacturers of products in the heating industry revised prices downward from 15% to 33% in order to stimulate activity. The government inaugurated a "Build Now" campaign and made an earnest effort for the resumption of normal activity.

Mr. Timmis then referred to the developments of the year in connection with the return of the soldiers and their gradual absorption by industry. The building of homes was resumed, he continued, but higher prices of labor and materials soon began to appear. In connection with the propoganda of distrust, disaffection and disloyalty, he said the society members can do much to counteract the revolutionary tendencies by keeping an active ear, and correct, by persuasive influence, any tendency to disloyalty as soon as it raises its head.

Mr. Timmis offered the slogan "Let us work," first uttered by Clemenceau, in one of his stirring calls to patriotism, as one that can well be applied here.

In the past, he continued, the engineering profession has been practically silent and non-assertive in the legislation of city, state and national affairs. As a society, we should be interested in legislation affecting protection of health and comfort, in the regulation and establishment of standards, and for the national support of a "General Engineering Bureau of Research," of which ours shall be a part. Other desirable objects are the recognition of standards of performance, and the determination and acceptance of guarantees; also the placing of engineers in public positions which require

an engineer's training as against the politician who usually occupies such places. Mr. Timmis endorsed the movement for a united front on the part of the engineering societies to secure the desired voice in legislation.

The remainder of the president's address was taken up with a running description of the origin and development of the society, in which many of the most striking achievements were brought out and commented upon in the light of present-day practice. Mr. Timmis spoke especially of the work done for the Bureau of Research by Former President J. I. Lyle and Former President F. R. Still, both during their terms of office and since that time. He also spoke of the satisfactory progress made by the bureau under the direction of Former President John R. Allen and mentioned the fact that Professor Allen has just been elected a vice-president of the American Society of Mechanical Engineers, as well as having been appointed a representative of the heating engineers' society on the Engineering Division of the National Research Council.

In closing, Mr. Timmis spoke of the growth of the society and of the great increase in the routine work which has trebled in the past year. He expressed his appreciation of the honor accorded him in his election as president and paid a tribute to the spirit of comradship that was to be found in the society.

The report of the council showed 1100 names on the membership list, an increase of 30% over the figures a year ago. The income, however, it was stated, is not sufficient to carry out the society's projects. (At a later session the meeting voted to submit a proposal to the members for an increase in dues). The council reported that the American Society of Mechanical Engineers had invited the society to consult with the mechanical engineers in preparing a code for low-pressure heating boilers. In response to the invitation the council appointed a committee of ten members to take up this work.

The report mentioned the change in the society's Journal from a quarterly to practically a monthly publication.

Secretary C. W. Obert, in his report, presented details of the society's increase in membership. He reported the appointment of four new committees, including those on legislation, revision of the constitution, automatic ventilation, and the one to confer with the boiler code committee of the American Society of Mechanical Engineers. The receipts for the year were $18,127.40 and the disbursements $17,847, leaving, with the previous year's balance, a total balance on hand of $4,246. Mr. Obert stated that there were then 35 new applications for membership in hand.

Treasurer Homer Addams, in his report, stated that the society was doing a business of over $22,000 a year.

The report of the Committee on Revision of the Constitution proposed an increase in the dues of from $10.00 to $15.00. A proposal that the amount of such dues should be divided so that a portion of them would be applied as the member's chapter dues started a discussion which led to the further consideration of the matter at a later session. It was subsequently voted to propose the following schedule: regular members, $15.00; associates, $12.00; and juniors, $10.00, $2.00 of this amount in each case to be applied to chapter dues. The balance of the fund which will be available through the fact that not all the members are located where there are chapters, will be utilized to start new chapters, to furnish speakers and to take up other extension work.

The report of the Committee on Automatic Ventilators stated that thirty letters had been sent out to makers, but the responses had not been satisfactory. The figures were given of a test made by the Construction Division in connection with war buildings. It was stated that the Construction Division had resorted to ridge ventilators on account of the lack of data regarding automatic ventilators. Dr. Hill stated that it was not very satisfactory to rate automatic ventilators on the amount of air they will handle. The best ventilator, he said, is the one which will pass the greatest amount of air at the lowest outside wind velocity. It was voted to turn over the report to the Research Bureau.

Other reports presented at this session were that of the Committee on Furnace Heating, Committee to Confer with the Weather Bureau, and Committee on Code for Testing Low-Pressure Heating Boilers.

As a result of the efforts of the Committee to Confer with the Weather Bureau, the U. S. Weather Bureau has devised a new form for its monthly meteorological form (No. 1030) to which have been added the data suggested by the committee on additional moisture readings. In explaining the new form, Professor C. F. Marvin, chief of the bureau, wrote to the committee that "it has not been feasible to make provision for exact moisture data, aside from the relative humidity, at all the observations, but in recognition of the constancy of the absolute humidity throughout the day, provision is being made to present this value for the noon observation. Furthermore, with the dry thermometer readings and the relative humidity given, other moisture factors may be readily determined from the 8 a. m. and 8 p. m. observations."

In presenting the committee's report, William G. R. Braemer, chairman, stated that the new form will contain all the information requested by the committee except the wet-bulb temperatures which, of course, can be readily obtained from the data given. The summary will now give (a) daily maximum, minimum and mean temperatures; (b) simultaneous dry-bulb temperature and relative humidity readings observed at 8 a. m., 12 m. and 8 p. m., daily; (c) vapor pressure observed at 12 m.

Evening Session, January 27.

At the opening of the evening session James P.

Warbasse, president of the Co-Operative League of America, delivered an address on "The Co-Operative Movement." He spoke of the rise of this movement in England and said that in this country there are now over 3000 co-operative societies operating stores in various parts of the country. One effect of the movement, he said, is that the co-operative stores are replacing the company stores. He described the movement as one calculated to promote international and industrial peace.

Director Allen presented a paper on "Heat Losses from Direct Radiation," together with the one by Professor F. B. Rowley and himself on "Determination of Radiant Heat Given Off by a Direct Radiator."

In commenting on the experiments, Professor Allen said the surface of a radiator that gives off radiant heat is not the same as the surface which gives off convected heat.

B. S. Harrison suggested that radiant and convected heat can be compared to static and velocity head in air movement. We can convert static head into velocity head, but not velocity into static head. With radiators radiant heat may be converted into convected heat and vice versa.

For the Committee on Research, Chairman J. I. Lyle stated that up to date 410 subscriptions had been received for the support of the Research Bureau, aggregating $20,150.50. One of the first steps taken at the bureau was to construct a "constant temperature" room and as this is practically ready for use, rapid progress may be looked for in the way of experimental work. As some of the subscriptions are spread over the five-year period the committee has available for 1920 the sum of $13,945. It is the desire to increase this amount to $25,000 and a drive was to be started March 1 to reach this goal by June 1. The total disbursements for the bureau from August 1, 1919 to January 1, 1920, were $3,191.98.

The report was accompanied by a statement from Director Allen in which he gave details of the "constant temperature" room in the basement of the Bureau of Mines Building which is without outside windows. The bureau's staff now consists of four, and two additional experimenters will be added by the Bureau of Mines. Among the apparatus and devices received are mercurial and recording thermometers from the Taylor Instrument Companies, Pitot tube from the American Blower Company, a whirling gauge from the Bureau of Mines and the lining for the "constant temperature" room from the Armstrong Cork Company.

Director Allen said that in the various research laboratories he had visited in other institutions very few were doing anything in connection with heating and ventilation, except the University of Illinois and Penn State College.

Among the first experiments to be taken up at the Research Bureau will be further tests on radiators and tests on the infiltration of air through windows.

F. R. STILL NEW CHAIRMAN OF COMMITTEE ON RESEARCH.

At the conclusion of the report the resignation was presented of J. I. Lyle as chairman of the Committee on Research. Former President F. R. Still was thereupon elected chairman of this committee. Mr. Lyle was made honorary chairman in appreciation of his efforts on behalf of the bureau and, in addition, was given a rising vote of thanks. During the meeting additional subscriptions were announced towards the support of the bureau, including $250.00 from the Fulton Company and $500.00 from Alf. Tjersland of Christiania, Norway, a member of the society, who was present at the meeting. Mr. Tjersland, with a number of his countrymen, is in this country on an economic mission and will visit the Pacific coast before returning to Norway.

Afternoon Session, January 28.

The Wednesday afternoon session was opened with the paper by E. S. Hallett, chief engineer for the St. Louis Board of Education on "An Advance in Air Conditioning in School Buildings." (Mr. Hallett's paper was published in THE HEATING AND VENTILATING MAGAZINE for February).

J. R. McColl in discussing the use of ozone said that in Detroit it had been found very difficult to avoid odors from the ozone apparatus itself. Mr. Hallett stated that the maximum amount used should be that which is below the point of emitting odors of is own. The amount can be determined by experiments.

A paper left over from the previous session was then presented on "Test to Determine the Efficiency of Coal Stoves," by Professor J. R. Allen and F. B. Rowley.

Tests to Determine the Efficiency of Coal Stoves.

While this paper was of only indirect interest to the heating engineer, the fact that stoves are used more than any other type of heating apparatus for house-heating purposes, made it of considerable timeliness. The efficiency shown by most stoves tested was an indication that little attention had been paid in their design to their ability to economize fuel. The tests showed that the best stoves are usually those which have the smallest lengths of cracks and seams. In some stoves there are so many cracks and seams that it is almost impossible to make them reasonably air tight. The result of the air leakage through these cracks and seams is to materially reduce the efficiency of the stove, and in the tests reported in this paper, it was necessary to cement the seams and cracks before satisfactory tests could be made upon the stoves. It was shown that in the stoves tested the design of the

heating surface with reference to the grate surface was not as it should be and with higher rates of combustion it was impossible to get the benefits of this added efficiency because the heating surface was insufficient to remove the added heat obtained, and the result of better combustion was only to increase the stack loss.

In connection with the paper it was stated that more house heating is done by stoves than by any other method.

The remainder of the session was devoted to papers on drying, including one by C. E. Mangels, of the Department of Agriculture, on "Recent Developments in Drying," and one by Dr. R. H. McKee, of Columbia University, on "Dehydration."

Mr. Mangels told of the work being done on the Pacific Coast where the products were being handled in carload lots. He said the industry is being successfully developed on a peace basis and that no extensive changes were to be noted in the way of drying equipment.

Two types of spoilage had been noted; infestation by moths and other insects in the dried products, and chemical changes not due to bacteria or moths. Mold was likely to develop during the drying process rather than after the material is dried, because it requires 24% of moisture for the development of mold. The average moisture content of dried food products is about 15%. It is necessary to pack the product in moisture-proof containers.

As far as insects are concerned, this, he said, is a hard factor to contend with. The fresh product is never infected by insects as the moth will lay its eggs only on dry surfaces.

He spoke of the practice of sulphuring vegetables which has long been the custom on the Coast. This, he said could be done in the case of vegetables without ruining the flavor, but with fruits the flavor is destroyed by this treatment.

The majority of dryers now in use are tunnel dryers. Mr. Mangels felt that dehydration as an industry has come to stay, but that a domestic market must be developed and that the success of any individual enterprise depends upon having a good business organization behind it.

Dr. R. H. McKee, who spoke next, has made a specialty of vacuum drying. He said that what the Civil War did for the canning industry, the World War has done for dehydrating. In Canada 44,000,000 lbs. of dried food products have been produced, 1 lb. being sufficient to feed 60 men. 50,000 tons of dried soup rations were also used during the war.

Dr. McKee thought the air process slightly more expensive to operate than the vacuum process, except when the units are large. In such cases the air-drying plants will operate at one-half the cost. The advantage of the vacuum process is in the decreased cost of fuel. He said it was not generally known that last year no less than 5,000,000 lbs. of dried eggs were imported from China.

Before the session closed a report was received from Frederic Irving Cooper, on "Status of School Ventilation in the United States," in which he said that out of thirty cities heard from, twenty were in favor of the mechanical system of heating and ventilation. He spoke of a recent trip he had made through Minnesota in which he found many fan systems were not being run on the order of the local boards of education. The only fans running were those that also furnished the heating. The reason given was that the cost of operation was too high. This was confirmed by the next speaker, Mr. Baldwin, of Boston, who urged action on the part of the society to insure the proper operation of the mechanical equipments that were installed at such a considerable cost and upon which the air conditions in school buildings depended to such an extent.

Evening Session, January 28.

The Wednesday evening session was devoted to house heating boilers, two papers being presented on magazine-feed boilers, one by Charles F. Newport, designer of the Newport boiler, and the other by E. C. Molby, president of the Molby Boiler Company.

The Magazine-Feed Boiler and Fuel Conservation.

Mr. Newport referred to the development of this type of boiler, pointing out the difficulties that had to be overcome in providing a magazine that would not burn out and which would keep the fuel below the point of ignition. It was also necessary to arrange the magazine so that it would not take up the space directly over the fire and to see that a fuel bed of uniform depth was obtained.

He pointed out that in the magazine-feed boiler the feeding of fuel is gradual, enabling the volatile gases as they are distilled to pass through the high temperature of the firebox and over the incandescent fuel. In that way the gases are completely consumed and, in the case of bituminous coal, the result is practically a smokeless boiler. The carbon of the fuel is brought to the incandescent stage under circumstances favorable to its complete combustion.

From the standpoint of fuel conservation, the ability of the magazine-feed boiler to burn the smaller sizes of anthracite was emphasized on the ground that these smaller sizes have nearly the same heating value as the larger sizes and are much cheaper.

Mr. Newport stated that the most practicable and successful method of obtaining a long firing period in burning the smaller sizes of anthracite in a heating boiler is by feeding the coal into the firebox from a magazine onto a sloping grate that will give a uniform fuel depth for proper combustion. The magazine should also be of ample capacity so that recoaling will not be necessary more than once in 12 hrs. as a minimum, and so situated so that it can be easily charged with coal and so that it does not affect the amount or sensitiveness of the heat-absorbing surface. The

magazine, he added, should be water cooled for durability, as well as to prevent the coal from burning and caking in the throat. He also pointed out that some method of supplying moisture to the ashpit, or a water spray, should be provided, both as an aid to combustion and to prevent the formation of clinkers on the grate when running under a high rate of combustion. The fuels, he said, which can be used in a self-feed type of boiler are practically limited only by the necessity that they must be sized.

In conclusion, he spoke of the savings possible in this type of boiler in connection with the conservation of labor, which, he said, will run as high as 75%. At the same time the steadiness with which heat can be delivered is a matter of the greatest interest to the house-owner.

Development of the Magazine-Feed Down-Draft Boiler.

In this paper, Mr. Molby began by calling attention to the importance of having high temperatures for combustion, both as regards the oxygen and the gases. These conditions, he said, have not been secured to the best advantage in ordinary types of boilers because the fuel has been added to the combustion end of the fire, in that way lowering the temperature of the combustion chamber. Further losses are due to exposing the heating surfaces of surface-feed boilers to the blasts of air that are taken in through the fire-door at firing periods.

Mr. Molby then took up the development of the magazine-feed type of boiler, using the down-draft principle of combustion, as invented by John R. Surrell. This was followed with a description of the Hawley down-draft furnace which he described as generally used throughout the United States with good success, having given to the heating and power world vast areas of coal that otherwise could not be used, except to the detriment of the health and property of the surrounding country.

The combination of the magazine-feed and down-draft principles, the speaker said, embodies all the desirable principles of combustion and is adapted for burning both bituminous and anthracite coal. Figures of the fuel saving possible with this arrangement were given as running from 30% to 50% over the up-draft surface-feed boiler. In the matter of automatic regulation, the fact that the magazine-feed boiler is not likely to exhaust its supply of fuel gave it an advantage, when the drafts are open continuously through the night.

Mr. Molby laid particular stress on the need of a tight chimney with sufficient flue area. He cited instances where the leakages in the flue itself may absorb the entire natural draft of the flue. Mr. Molby thought the boiler connections and the conditions under which it is set should be covered by an ordinance or law laid down so that conditions for economy and efficiency will be maintained, compelling conservation of fuel. He also urged the society to take up the matter of boiler construction, with special reference to the matter of combustion. He urged that specifications of chimney flues to meet the various conditions of building should be laid down, particularly for the benefit of architects. The arrangement and the local conditions on the job should also receive attention, such as the arrangement of dampers, their operation, and the care and management of the boiler itself.

In the discussion Homer Addams said that 99% of faulty boiler installations are due to inadequate draft. This is not only on account of lack of chimney area, but also leaky joints in the chimney.

Mr. Hamill said that the engineers should tell the architects what size of flue to specify and suggested the appointment of a committee to follow up this matter. It was later referred to the Bureau of Research. Another speaker stated that slicing a fire in a magazine-feed boiler is not so easy as in the surface-feed type. In the matter of chimneys he thought the bricklayer was the prime factor. It was brought out that the manufacturers' catalogues are full of data regarding the proper size of flue to build, the speaker stating that "this is the best alibi the architects have got."

The final paper at this session was presented by P. J. Dougherty, engineer of the International Heater Company.

Relation of Boiler Heating Surface Area to Boiler Capacity.

Mr. Dougherty's paper was an argument against the practice of comparing the relative capacities of boilers on the basis of the relative amounts or areas of the heating surface they contain. He said a sharp distinction should be made between standards for high-pressure boiler practice and those for heating boiler practice, and cited the length of firing period as one of the most important differences. Mr. Dougherty quoted from a number of government bulletins in proof of his stand and declared that the only logical boiler capacity rule was that formulated by the society's Committee on Code for Testing Low-Pressure Heating Boilers. One of the diagrams included in the paper showed how wide a difference there was in the relation of heating surface to the rating of five well-known boilers.

The arrangement or design of the heating surface, continued the author, is what the modern designing engineer worries about, but he doesn't give a thought to the area or extent. Regarding the idea of considering the grate area and heating surface area together, he said that the grate area varies just as much as regards boiler capacity as the heating surface area and to prove his point he presented a few examples showing, among other things, that two boilers made by the same manufacturer are rated at 8,000 sq. ft. and 4,650 sq. ft. and still have the same size grate of 18 sq. ft.

He characterized the society's rule as quite simple

and practicable, containing but three factors. To determine a boiler's capacity in pounds of steam per hour, you multiply the available fuel capacity in pounds by the evaporative power in pounds and divide by the length of firing periods in hours. The evaporative power is the number of pounds of steam from and at 212° F. which the boiler can generate from a pound of standard grade of fuel. With hard coal the available fuel shall not exceed 80% of the boiler's fuel capacity. These factors must be determined from actual tests in accordance with the rules of the Boiler Test Code.

Morning Session January 29.

Before the opening of the Fuel Session, Thursday morning, a paper was presented by Dr. W. H. Walker, director of the Research Department of the Massachusetts Institute of Technology, on "Four Years' Experience in Prevention of Corrosion of Pipe," of which he was joint author with F. N. Speller, metallurgist of the National Tube Company. Dr. Walker supplemented his paper with an interesting blackboard talk on the chemical action of corrosion.

Four Years' Experience in Prevention of Corrosion of Pipe.

This paper supplemented those previously presented by Mr. Speller on effective measures designated by him for the prevention of rust in pipes. In a previous paper an account was given of an experimental plant for the removal of oxygen from hot water in the Irene Kauffman Settlement House in Pittsburgh, the principle employed being to fill a storage tank with suitably prepared steel lathing designed so as to pack closely with an exposed surface of approximately 100 sq. ft. per cubic foot of space. In passing the water heated to 160° F. through this metal, all the oxygen became fixed in the form of hydroxides which were removed by filtration through a sand filter. The result was water inactive toward iron or other metals, free from oxygen but otherwise unaltered in composition except for the presence of a small amount of free hydrogen resulting from solution of iron in the "deactivating" tank.

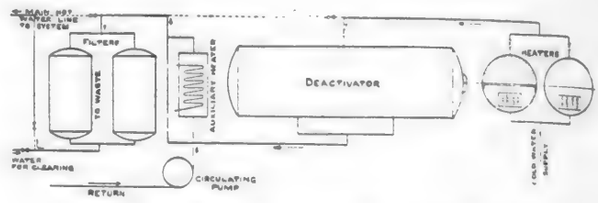


FIG. 2—MAIN FEATURES OF DEACTIVATING PLANT.

The paper went on to describe the installation for a 12-story building containing 107 apartments, on 47th and 48th Streets, New York. This plant was designed to deactivate 6000 gal. of water per hour at a temperature of 160° F. The size was over ten times that of any previous plant. The piping arrangement and filters were laid out as shown in Fig. 1. The plant consists of two steam heaters and storage tanks of the usual type, the outlets of which are connected with the top of the deactivating tank 15 ft. long and 5 ft. in diameter, filled through the manhole at one end

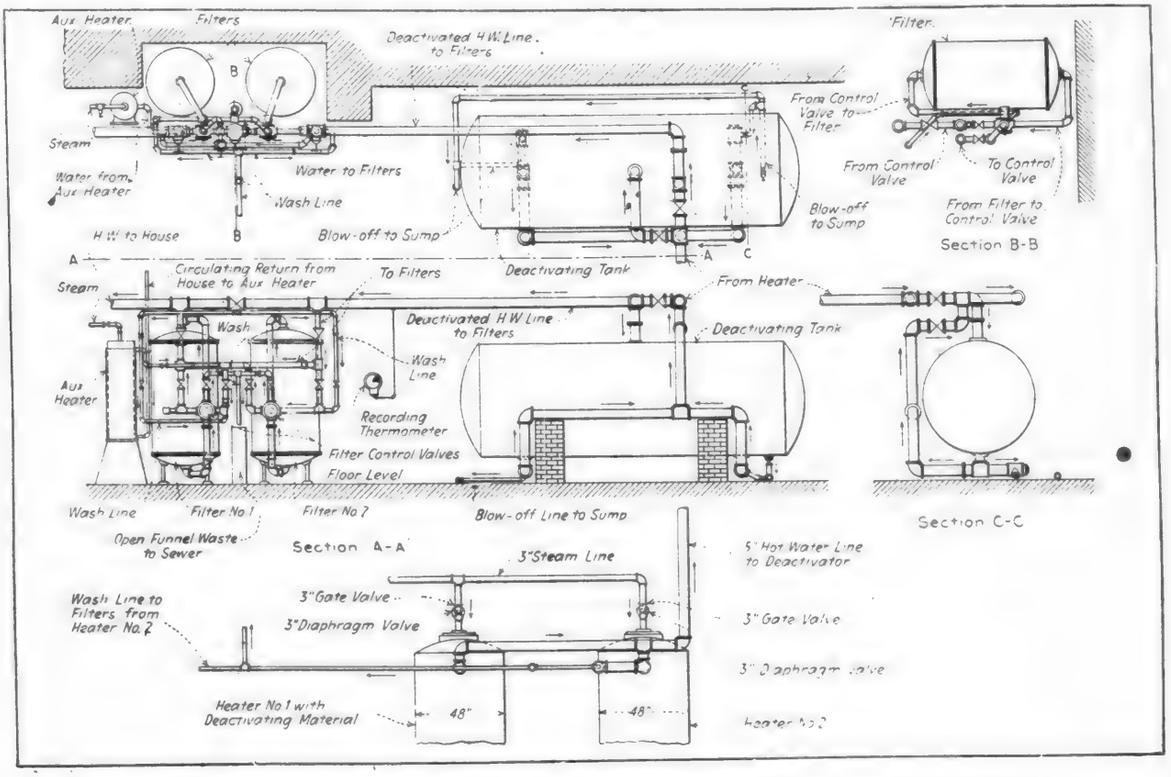


FIG. 1—ARRANGEMENT OF PIPING AND FILTERS IN DEACTIVATING PLANT OF 12-STORY APARTMENT BUILDING.

with strips of steel lathing supported on cross bars 4 in. above the bottom of the tank. The water is drawn off at two places and passed through sand filters. From these filters the water is passed through the system and is circulated by centrifugal pumps through return lines and a small booster heater to the filters and back to the system again. Thus only the makeup water is passed through the main heaters and deactivating tanks. In this system, with a maximum flow of 5000 gal. per hour, the free oxygen is reduced to less than 0.1 cc. per liter. The conclusion reached after four years' service was that this particular plant has been designed somewhat too large for the building as far as deactivating space is concerned, but was highly successful in accomplishing the purpose for which it was designed.

A discussion of the cost of installation brought out the statement from Perry West that this will run from 2½% to 4% of the cost of the plumbing. Using brass pipe the cost will amount to 10% of the plumbing. The cost of operation is very slight, requiring only the washing of the filter once a week. It was also stated that the filter is not necessary if discolored water is not objectionable.

OIL-FUEL SESSION.

The papers presented at the fuel-oil session covered various phases of the situation now existing on the Atlantic seaboard. A clear insight was given of the possibilities of adopting fuel-oil and it was made plain that the matter had not yet reached a stage where the substitution of fuel-oil for coal was justified except in certain individual cases and depending, even then, on the availability of a sufficient and regular supply. It was admitted by the oil people present that no more fuel-oil contracts are being made, although it was expected that the supply would come in regularly in the course of a few months.

The session was opened by H. H. Fleming, engineer of the Fuel Oil Department of the Standard Oil Company, who gave a general account of the use of fuel-oil, showing the essentials required in the way of storage tank, pump, heater and burners. He discussed methods of atomizing the oil, steam being the medium most used. The furnace design, he added, and not the type of burner is the important part of the installation. He also discussed transportation and storage, bringing out the fact that in handling the heavy oils the oil cars are equipped with steam coils so that they may be readily unloaded in cold weather. Regarding the use of concrete and steel storage tanks, the said concrete tanks will hold heavy oil without trouble, but steel is usually cheaper and more satis factory especially for large tankage.

The next speaker was F. W. Staley, engineer for the Texas Company, who told of the large deposits of oil discovered in various parts of the world in recent years which he divided into those having a paraffin base, an asphaltic base, and oil fuel. The asphaltic base oil is that which comes from Mexico. In comparing the costs of fuels he said it was found in practice that 4 bbl. of oil is equal to one ton, 2240 lbs. of coal.

Spray burners, in which the oil is atomized by steam or compressed air, are almost universally used for land practice. Mechanical burners, in which the oil is atomized by submitting it to a high pressure and passing it through a small orifice, are of recent development, the most successful being of the round flame type. A good steam-atomizing burner has a capacity of somewhat over 400 H. P.

Mr. Staley endorsed the statement of Mr. Fleming as to the importance of furnace design.

"Fuel Oil Equipment" was the subject of the next paper, by John P. Leask, of Gilbert & Barker Mfg. Co. He gave some interesting data on the location and construction of storage tanks, following this with proper methods to be followed in feeding the oil to the burners.

In the following paper on "Oil Fuel Versus Coal," by David Moffat Myers, the limitations in the use of fuel-oil were emphasized, as outlined in the report of Mr. Myers's discussion at the November meeting of the New York Chapter of heating engineers (reported in THE HEATING AND VENTILATING MAGAZINE for December, 1919). Mr. Myers made the point that oil is not plentiful or cheap and a constant or steady supply cannot be relied upon, except in a comparatively few favored localities. He instanced the rules recently adopted in New York for the storage and use of fuel-oil as showing how stringent are the requirements in this connection. One effect of these requirements, he showed, was to make it possible to store only 15 tons of oil in a space that would accommodate 25 tons of coal. He also spoke of the cost of making a fuel-oil installation which, with the storage tank, might easily run up to $60,000. Even then it would be necessary, in his opinion, to install a coal-burning equipment for possible contingencies.

He did say, however, that there are undoubtedly a great many cases where oil would be the more economical fuel to employ as, for instance, where a long contract for oil supply could be secured and where the labor stiuation was the deciding factor.

The final speaker on the subject was W. C. McTarnahan, vice-president of the Petroleum Heat & Power Company. Mr. McTarnahan told of the early history of oil fuel in California where it was found in pools from which it was later piped to points where it could be used. Referring to the various methods of atomizing the oil he stated that one company has as many as 5000 installations in low-pressure heating plants in which the atomization is accomplished by mechanical devices, without steam or compressed air. No satisfactory equipment, he said, has as yet been developed for burning fuel oil in residences burning up to, say, 15 tons of coal a year.

Wonderful progress, he continued, has been made on the Atlantic seaboard since 1915 in the burning

of fuel oil. The logical and only source of fuel supply is Mexico. Just at present the Carranza régime is operating to confiscate the oil properties of many Americans but the law making this possible will probably be repealed shortly. He stated that the oil supply of Mexico is only scratched, one oil tract as yet undeveloped comprising 460,000 acres.

In New England, said Mr. McTarnahan, there are now some 5000 concrete oil storage tanks in successful use. In New York City the requirements make steel tanks compulsory.

In burning fuel oil, automatic control is vital. This means draft control, as well as the atomization of the oil.

In the ensuing discussion it was brought out that the large oil companies are reluctant to make new contracts until larger tonnage in ships is available. The cost of oil storage is high in New York, but not in the country districts. Boiler tubes will not burn out if properly installed. Low gravity oil is best for low-pressure heating work. One reason why the oil must be fed at a temperature at which it will atomize readily is that otherwise it will carbonize. It is possible to waste more oil than coal although, when proper precautions are taken, there is less chance of waste with oil than with coal.

A cargo of oil runs from 60,000 to 80,000 bbls., 4 1/2 bbl. equaling one ton of coal. It takes seven days to make the trip from Tampico, Mexico, to New York.

President Timmis summarized the discussion by stating that Mexico has the only fuel-oil supply available, the quantity being uncertain. Several factors have an important bearing on the situation, one being the attitude of the Carranza government. Others are facilities for transportation and storage, the fact that heavy oils have to be liquefied and the necessity for controlling the combustion.

George B. Nichols said the agitation for the adoption of fuel oil was very wide and it had even been proposed that pipe lines for oil be laid in lower New York, although this, of course, could not be done under the present restrictions. It is also proposed to locate oil tanks all along the line of the Barge Canal from Albany to Buffalo.

He questioned the figures given for comparative cost of oil and coal and said that competition with the coal companies might result in a lowering of the cost of coal which would at least divide the country into fuel zones. He thought this scheme might be adopted in any event and suggested that the Bureau of Mines should be asked to look into the matter.

No labor, he said, is saved in the modern plant by burning oil, and he cited the plant of the Narragansett Electric Light Company which had been changed over to burn fuel oil, being equipped with a $34,000 storage tank of over 1,000,000 gal. capacity. Oil, he said, does form a clinker which is very hard to remove.

Another speaker cited the fact that two Hudson River boats of almost identical size and equipment are shortly to be tested, one burning coal and the other fuel-oil. Comparisons will be possible when these tests are carried out and it was suggested that the society appoint a committee to observe them.

Mr. Fleisher spoke of the uncertainty of oil supply which made it necessary to install combination systems and he said an important factor to be considered in that connection is the time required for turning oil-burning burners back to coal-burners, and vice versa.

A misunderstanding of the terms "specific gravity" and "degrees Baumé," was cleared up when Charles R. Bishop explained that the Baumé scale is a measure of the viscosity of the oil, so that as the specific gravity increases, the degrees Baumé decrease. For instance, an oil with a specific gravity of 0.933 would equal 20° Baumé, whereas an oil with a specific gravity of 0.9589 would equal 16° Baumé. This cleared up the point raised by one speaker that the New York requirements prevented the use of Mexican oil, because they specified oil not lighter than 0.933 sp. gr. and not heavier than 12° Baumé must be used. It was shown that Mexican oils are, therefore, permitted by the New York requirements.

The storage restrictions of New York City practically prohibit its use in that city. Mr. Fleming said the cost of storage would run about $1.00 per barrel of storage. Many plants have been changed over outside of New York City, notably the Washington Sugar Refinery Co., Jersey City, the General Chemical Co., and Spencer-Kellogg Co.

Mr. McTarnahan said the present cost of oil is from 4.3 c. to 5 c. per gallon which would be equal to coal at $9.00 per ton. In reply to this Mr. Nichols said that in Providence the cost of oil is $1.40 per barrel while the cost of coal is $8.00 to $9.00 per ton. Mr. McTarnahan further stated that while it is not possible to get oil into New York today, his company will be able to do so within the next three months. At that time he expected the price would be below 4 1/2 c. to 5 c. per gallon. His company is now building a large fuel-oil storage plant in Stamford, Conn.

At the conclusion of the session it was voted to have the society's Research Bureau undertake a further investigation of the use of fuel-oil. The matter of having a committee observe the tests of the two river boats was also referred to the Research Bureau.

Afternoon Session, January 29.

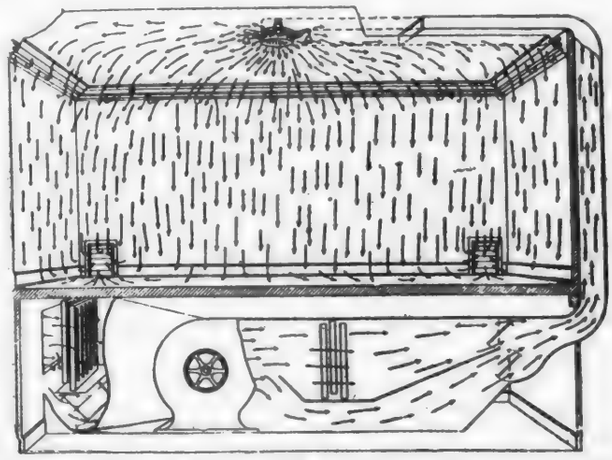
At the final session the paper on "Test of the Beery System of Heating and Ventilation," by C. E. Beery, and one on "Pulverized Fuel," by E. R. Knowles, were read by title.

Test of the Beery System of Heating and Ventilating.

In this paper details were given of an exhaustive test of the Beery System in the Lincoln School, Rockford,

Ill. This particular installation was described in THE HEATING AND VENTILATING MAGAZINE for August, 1919 and was accompanied by figures of a test discussed by Dr. E. Vernon Hill. As will be seen from the accompanying illustration, the system differs radically from the ordinary type. In addition to having the air inlet at the ceiling and the outlet registers at the floor line, the system embraces the use of two coils of 1 1/4-in. pipe running completely around the room above the picture moulding to offset the heat loss from the room. This makes it possible to maintain the temperature of the ventilating air at 75° F. for the "warm" air and 65° F. for the "tempered" air.

After describing the equipment in detail and the method of making the test, the results are given which make a remarkable showing for this system. In connection with the ventilation tests the air diffusion was determined by means of finely-divided strands of silk floss which was placed in many positions and the



TYPICAL APPLICATION OF THE BEERY SYSTEM TO A SCHOOL ROOM.

movement of the strands noted. The singular absence of lateral air currents within the breathing zone of the pupils was noted. The air movement in this zone was found to be uniformly down at the rate of about 2 ft. per minute.

Another test was run by turning steam into the room through the diffusers. The steam descended as a blanket across the entire area of the room. A "cascading" effect at the windows was quite noticeable. Here the water vapor and air descended at possibly twice to three times the rate of the main blanket. A clear vision could be had entirely across the room until this blanket was 3 in. from the floor.

A second test of this kind was made in which steam was allowed to flow through the duct until a layer was formed about 3 ft. in thickness; then the steam was turned off. In this case the steam blanket descended in a solid layer with air above and below it until it reached the floor. In this test lighted candles at each desk were substituted for the heat given off by the pupils.

In the temperature tests, which were made with the system in regular operation, it was found that, with the exception of the small zone surrounding the heating coils, there was but 2° difference between the ceiling and the floor, and not 1° difference in any part of the breathing zone.

An address was delivered by Major R. W. Alger on the work of the Construction Division of the War Department, in which he gave interesting statistics of the vast operations carried through by the Construction Division. He felt that the experiences gained should not be allowed to be wasted and suggested that the engineering societies take steps to keep their records in such order that the government would always be able to secure information on short notice of the members' capabilities in a given emergency.

The final papers on the programme were on "Atmospheric Heating System for Railroad Cars," by Thomas H. Ireland and on "Color Schemes for Distinguishing Plant Piping," by H. L. Wilkinson; also a report of progress in warm-air funace testing at the University of Illinois, by A. C. Willard.

A Report of Progress in Warm-Air Furnace Testing at the University of Illinois.

In this report a review was given of the data, results and testing methods used in the investigation of warm-air furnaces which has been in progress at the University of Illinois during the past year. The work is being done under a co-operative agreement with the National Warm Air Heating and Ventilating Association. Besides the main testing equipment, which consists of a complete recirculating gravity furnace system, with typical leaders, stacks and registers, which are carried by a three-story steel structure serving as the working skeleton of a house, there has recently been erected a heat transmission plant for studying the relative heat transmission of covered and uncovered tinned, galvanized and painted leader pipes.

Some of the things already brought out by the tests are:

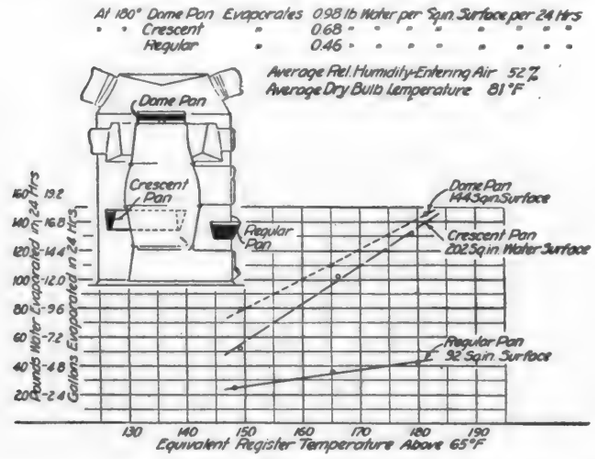
The efficiency and capacity of a warm-air furnace, as expressed in B. T. U. per square inch of leader pipe area, available above 70° F. at the register faces, varies greatly, increasing very rapidly as the register temperature increases.

A square inch of leader pipe area in the first floor leader has far less heating and air-carrying value than in a second or third floor leader as actually installed. In one test, for instance, a square inch of leader to first floor carried 50 B. T. U. per hour available for heating above 70° F., and for a third floor leader this value rose to 122 B. T. U. per hour, making an increase of 144%. For the second floor the B. T. U. per square inch is 89, or an increase of 70%. A comparison of leader velocities for this same test showed 118 ft. per minute for the first floor, and 268 ft. per minute for the third floor, which is an increase of 127%. For the second floor the increase in velocity was 85%.

What is described as a still more significant dis-

covery was made when it was found that a square inch of first-floor leader increased its capacity in available heating value above 70° F from 50 B. T. U. to 134 B. T. U. per hour, a gain of 170%. For a second floor leader this value increased from 89 to 168 B. T. U. per hour, or a gain of 89%, and for a third-floor leader this value jumped from 122 B. T. U. to 243 B. T. U., or a gain of 99%.

If a comparison of velocities in the leaders is made for these same two tests, it is found that the first-



EVAPORATIVE CAPACITY TESTS OF THREE TYPES OF PANS.

floor leader velocities have increased from 118 to 183 ft. per minute, a gain of 55%. In the case of second-floor leaders, the velocities have increased from 219 to 268 ft. per minute, a gain of 22%, and for the third-floor leaders the velocities show an increase of from 268 to 331 ft. per minute, a gain of 24%.

It was also noted that the distribution of the air by weight to the various floors changed with the increasing register temperatures.

The practice of dampering leaders to upper floors as a result of poor design immediately cuts down the total capacity of a plant.

EVAPORATIVE CAPACITY TESTS OF WATER PANS.

The evaporative capacity of water pans as used in furnace installation was made the subject of special study by W. E. Pratt, formerly Research Associate. The results apply to the three common types of pans, all of which were run successively in the furnace as shown in Fig. 1, when operating as a complete system.

It will be noted that the dome pan is by far the most effective per square inch of surface, and that its total evaporation is greater than the crescent-shaped pan around the fire pot up to the maximum temperatures used. The limited evaporation which takes place from the regular type of pan is too little to produce any appreciable effect, as is very well known to anyone who has ever attempted to determine the effect of such pans on the humidity of a heated house.

There are two vital problems, continues the report, which have made and will continue to make the testing of a gravity warm-air furnace heating system a most difficult and elusive undertaking. The first problem deals with the measurement of the temperature of the air flowing through the ducts, casing, leaders and stacks of a furnace system. It has been necessary to make a special study of radiating effects due to hot furnace castings. The report shows the efforts made to meet this difficulty.

The other problem is that of measuring the air velocity through the inlet and out through the leaders and stacks. When it is remembered that the actual velocities range from as low as 2 ft. to a maximum of seldom over 5 ft. per second in these systems, it will be apparent that no ordinary differential gauge will be of value in making these direct measurements. In an attempt to get greater accuracy in the calibration of the anemometers used, the experiment station is making an attempt to obtain a fundamental measurement of air that will be more accurate than can be made by either a Pitot tube or orifice, which methods, it was found, do not check each other when placed in the same line by from 5% to 10%. Further details of this method will be given in subsequent reports.

One of the conclusions reached was that the successful testing of a warm-air furnace is so tied up with the testing of the furnace heating system as a whole that to attempt to test the furnace without the plant is of little or no value, if rating or capacity data, as well as thermal efficiency and economic performance data are desired.

Another conclusion was that furnace test procedure as to the method of handling the fire and the computation of results is of secondary importance and should be worked out to accord as nearly as possible with the steam heating boiler code.

Heating Engineers' Annual Dinner.

The presence of Former Secretary of Commerce William C. Redfield lent an air of distinction to the annual dinner of the heating engineers, held January 29th at the Hotel McAlpin, which, with the large number of guests present, ranked it as the most brilliant affair of its kind in the history of the society. The retiring president, Walter S. Timmis, was toastmaster and the speakers, in addition to Mr. Redfield were Former President F. R. Still, the new president, Dr. E. Vernon Hill, and Charles Ferguson, who was already known to many through his addresses before the New York Chapter of the society.

Mr. Still spoke interestingly of his recent trip around the world. He gave a vivid description of a typhoon he had experienced in China. Unfortunately, many of the curios and engineering data he had collected on his trip were destroyed in a train wreck on the way from Halifax to Detroit, on the last lap of his journey.

Dr. Hill sprang somewhat of a sensation by stating that he was

about to fulfill a promise made to the New York heating engineers some time ago to define the term "aerologist." He then went on to say that "ventilation" is a word that does not convey the proper meaning, as it means literally "to blow through." We know, for instance, that it would not be correct to say that the opening of the windows of a car constitutes ventilation. "Fresh air" and "foul air," he held, are other terms that should not be used by engineers.

In short, we need new terms to accord with the progress of our profession. By "ventilation" we really mean "aerology." Dr. Hill urged the adoption of this term, stating that it would eliminate, among other things, any ground for argument between the advocates of mechanical and natural ventilation.

Former Secretary of Commerce William C. Redfield responded to the toast, "Commercial Relations of the United States." He cited the fact that the Declaration of Independence was addressed to the world and argued for a broader attitude on the part of the American people in the matter of foreign relations. The fact that Europe owes us fifteen billion dollars is a very practical reason why our relations with Europe should become closer than heretofore. He likened Europe to an old customer of a business house who had become temporarily embarrassed financially through no fault of his own, and declared that the sane business man would not hesitate to extend credit to such a customer when such a course would again put him on his feet. This, he said, is what America must do with Europe if we are ever to be paid back the colossal debt owing to us. Certainly our present income taxes will not be reduced until that debt is paid. "I know we are not in business for our health," he concluded, "but we believe in doing business in a healthy way."

The final speaker, Charles Ferguson, said that the old system of finance in both Europe and America are what are going into the discard, as evidenced by the fall of foreign exchange. He spoke of the tragedy of the decline of the pound sterling and declared "it will never come back." He elaborated his views on the new element of "credit capital" which is to rule the world and assigned a high place to the engineer in the coming industrial age. He stated that the reason more rapid progress is not being made in adjusting our financial relations with Europe is that America will not deal with the Old World on the old-world basis. In the future, he maintained, industrial enterprise will be governed by the demand for the product and the efficiency with which it may be manufactured, rather than by the edicts of high finance, looking only for big profits and its own aggrandizement.

This concluded the speaking and the remainder of the evening was given up to dancing.

The Entertainment.

A delightful program for the ladies was carried out by a committee of the New York Chapter, headed by W. H. Driscoll, and including Arthur Ritter, B. K. Strader, William G. LeCompte, J. Barton Garfield, H. J. Issertell and Arthur A. Kiewitz.

On Tuesday evening a party was made up to visit the new Capitol Theatre. The following day a luncheon was given at the Hotel Pennsylvania, after which the ladies were taken to the Loft candy factory where the various operations in candy making were watched with interest. Equally interesting were the provisions made for the welfare of the workers which gave an insight into the methods now used by successful employers in looking after those in their employ. The company's welfare department is in charge of Mrs. Elinor Sherman Rockefeller, who accompanied the party and explained the many ways in which the health and comfort of the workers were kept at a high standard, contributing not only to the best of working conditions but securing a quality of output that reflected great credit on the management. Upon leaving each lady was presented with a box of candy. In the evening the ladies were taken to the 49th Street Theatre where they saw "The Storm."

On the concluding evening of the meeting the ladies attended the society's annual dinner at the McAlpin.

ANNUAL DINNER OF AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, AT THE HOTEL McALPIN, NEW YORK, JANUARY 29, 1920.

The Heating and Ventilating Magazine
A MONTHLY JOURNAL of ENGINEERING PROGRESS
Member of the Associated Business Papers Inc.
Member Audit Bureau of Circulations.

Vol. 17 March 1920 No. 3

Published Monthly at Cooperstown, New York, by the
HEATING AND VENTILATING MAGAZINE COMPANY
Executive and Editorial Offices
1123 Broadway, New York
A. S. ARMAGNAC . . . . . President and Editor
GUSTAVE PETERSEN, Secretary-Treasurer and Business Manager

European Representative
W. G. HOLLINGWORTH, 304 High Holborn, London, W. C.

Subscription	$2.00 per year
Canada	2.25 per year
Foreign Countries	2.50 per year
Back numbers	25 cents each

CHICAGO is setting a pace in the matter of following up the ventilation of its buildings which is making other large American cities "sit up and take notice." While New York is quibbling over the respective merits of natural and mechanical ventilation, Chicago's health commissioner, Dr. John Dill Robertson, has evolved a scheme for taking this and other matters of the same sort out of the realm of controversy by establishing what will be known as the "Division of Air Conditions" of the Department of Health. This division will have the last word on the inspection and control of the installation and maintenance of heating and ventilating equipment, the inspection of rooms for natural and mechanical ventilation, the prevention and abatement of smoke, gas and fume nuisances, the examination and approval of plans of all heating and ventilation installations, and of all smoke, gas and fume creating prevention and abatement installations installed or reconstructed in any building, location or on any premises within the jurisdiction of the City of Chicago.

This centering of authority is achieved through combining the Division of Ventilation, formerly existing in the Department of Health under the direction of Dr. E. Vernon Hill, with the old Department of Smoke Inspection. The new division, therefore, will have control of air conditions both inside and outside of all buildings.

The head of the new division must be an engineer qualified by technical training in the theory and practice of heating and ventilation and air conditioning. He must also be experienced in and thoroughly familiar with the design and construction and operation of steam boilers and furnaces and in the theory and practice of smoke prevention and abatement. Under the division, all new power and heating plants and reconstructions of old plants must have the approval of the commissioner of health. The plans and specifications must show the amount of heating to be done in each case and what provision has been made for complete combustion of the fuel, including the kind of fuel it is proposed to use.

NOR IS this all. Not only will the new division exercise control over the ventilation of public buildings, factories, etc., but enforcement of the new temperature requirements will also be assigned to this division. A new ordinance has been drafted by Dr. Hill setting forth certain requirements as to the temperatures to be maintained, both in apartment buildings and in factories and workshops. While this is not entiely new, New York having enacted a similar rule during the present heating season, the Chicago ordinance is the first in which recognition is given to the importance of wet-bulb temperature as a factor in comfort.

For instance, after stipulating that a minimum temperature of 68° F. is to be maintained, the proposed heat ordinance goes on to say:

"In buildings or portions thereof occupied for businesses, trades or occupations or manufacturing processes the nature of which requires a higher or lower temperature than 68° F., the moisture content of the air shall be increased where the temperature maintained is below 68°, and the moisture content of the air shall be decreased where the temperature maintained is above 68° in the proper amount to main tain a wet-bulb temperature between 54° and 58° F. In special manufacturing processes where it is desirable to maintain a wet-bulb temperature below 54° F. or above 58° F., the Commissioner of health at his discretion, may permit the maintenance of other temperatures, provided reasonable precautions and safeguards are adopted that will in his judgment meet these special requirements."

Chicago's Division of Ventilation has already made an important contribution to the art in placing the mysteries of ventilation on a practical basis through the use of the Hill synthetic air charts. The new move is no doubt a direct result of this accomplishment, so that the credit for the advance will naturally be given, in a large measure, to the head of that division. Incidentally it shows how far other cities must still go on the road towards the proper regulation of air conditions and the immense vista that lies before the industry in this direction alone.

A CONSTANT and urgent demand for the "standard data sheets" which have been a regular feature of THE HEATING AND VENTILATING MAGAZINE since February, 1917, is a significant indication of the eagerness with which men identified with this field continue to seek authoritative information in their particular branch of engineering. At the same time it furnishes interesting evidence of the growth of this branch which in recent years has attracted great numbers of recruits, many of whom are frank to admit their inadequate equipment for their work. In this connection we feel fortunate in being able to announce that a special series of data sheets on gravity and forced water heating will begin in the April issue.

WRINKLES

Returning Condensation From Institutional Groups of Buildings Covering a Large Area.

The condensation return system for a group of buildings presents an important, and by no means simple, problem, especially when the buildings extend over a considerable area of ground. While the heating of these buildings may be forced water circulation or other means, steam at high or intermediate pressures is required for the heating of domestic water, cooking, drying or sterilizing, the condensation from which must be run to one or more adjacent traps, as the conditions may require.

How best to return the condensate from these sources to the central heating plant is the problem. If the various traps located at widely-scattered points discharge into a common return line, they will operate against unequal back pressures. To overcome this difficulty, it is necessary that a certain number of traps be grouped, and the condensation from each group collected into a return tank, one tank being placed in each building. The condensation from each tank can then be run by gravity to the suction switch operated by a float in the tank. The float rigging can be adjusted to permit the pump to return small or large quantities of water as desired, and the rate of discharge can be controlled by a valve. All pumps discharge into one main return pipe, and this can empty into the feed-water heater in the boiler plant.

It is necessary that all traps be grouped in their natural order as determined by the structural conditions, so that, so far as possible, all traps of the same group will work against the same back pressure.

By this scheme, the discharge through long return lines is made positive, because of the pumps, which being motor-driven, are entirely independent of variations in steam pressure for reliability in operation. The traps being vented, are under atmospheric pressure only, and each trap of a group has the same freedom of discharge, all traps being roughly the same distance from the return tank of their group.

Proper Application and Use of Leather Belting.

Leather belting, though often used in connection with ventilating fan drive, is not otherwise used to any great extent in the work of the heating and ventilating engineer. Consequently, its proper application and use does not seem to be given the thought which its merits. The following should serve as a guide in this respect.

Single belts over 8 in. are not recommended. Double belts should be used for heavy work, except for running over pulleys under 6 to 8 in. in diameter, in which case extra heavy single or light double may prove more economical.

Light doubles have many advantages over singles,—more even thickness, run truer, better for step and flange pulleys, and for shifting, and for

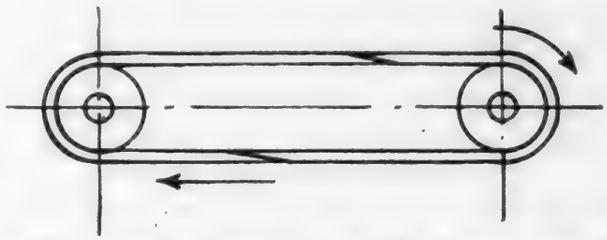


FIG. 1—METHOD OF RUNNING BELT FOR PROTECTION OF LAP JOINTS.

heavy drives on pulleys not under 5 in. in diameter, where a full double is not required. The increased thickness increases the carrying capacity and reduces the stretch.

Where possible, it is best to use pulleys of rather large diameter, and frequently to run double belts on them. The increased diameter lessens the wear on the belt, and gives sufficient pulley contact to permit narrowing and doubling it. The higher belt speed caused by larger pulleys is also favorable to easy transmission of power, provided the speed does

FIG. 2—ANOTHER METHOD OF PROTECTING LAP JOINTS OF BELTS.

not exceed 3000 to 5000 ft. per minute, according to the size of the pulleys.

The strongest part of leather belting is approximately one-third the way through from the flesh or rough side. It is, therefore, desirable to run the grain or smooth side on the pulley so that the strongest part of the belt may be subject to the least wear. The flesh side is not as liable to crack as the grain side when the belt is old, hence it is better to crimp the grain than to stretch it. Belts are usually marked with an arrow in the direction they should run.

Single belts should be installed with the inside joints of the laps running towards the pulleys (Fig. 1) The outside point is more liable to be turned up by the air or by striking against something as it runs around than the inside point is from rubbing against the pulley. Double belts

should run with laps pointing away from direction of running (Fig. 2.).

If possible, belts should not run vertically. They should be kept clean and where exposed to dust or dirt, should be occasionally rubbed with waste or some coarse fabric. Machine oil should not be allowed to get on oak-tanned belts. If a lap should become loose, mend it with cement rather than by riveting, since these weaken the leather and may impair the smooth running of the belt.

As a rule, if fair results are not obtained by keeping belts at the proper tension and using a good dressing, it may safely be concluded that the belt is too light or too narrow for the work. Frequently it is an advantage to cover pulleys not used in damp places with a good leather lagging, put on by an experienced workman. A pulley so covered is capable of much better results, as the belt is not so liable to slip.

In the location of shafts that are to be connected with each other by belts, care should be taken to secure a proper distance, one from the other. It is not easy to give a definite rule as to what this distance should be. This rule has been used with success: Let the distance between the shaft be ten times the diameter of the smaller pulley. There may, however be exceptions to this.

The flop or wobble noticeable in some belts may be caused by a slight irregularity in the cut-off, or some defect in the governor rigging of the engine, or a marked variation in load may produce a similar result. Pulleys not properly crowned or out of line, machines not setting level, bearings too small or poorly babbited, may make a good belt run unsatisfactorily.

A belt may run crooked if the ends are not properly squared before lacing, if laced tighter on one edge than on the other, or if one edge of the belt has been stretched when forced on after being made endless, or when permitted to climb a step or flanged pulley. The endless belt is unquestionably the best belt for most drives. Large belts say 8 in. or wider, and all belts that run at a high speed over small pulleys, give better satisfaction, run truer, last longer and require fewer stops when made endless. It avoids the tearing out of laces and fasteners, assures a continuous grip on the pulley, and when properly done permits the belt to run without bumping and threshing due to thick or stiff joints.

Should a necessity for belt dressing arise, as may be the case occasionally, a very light application of boiled linseed oil, or of castor oil will not injure the belt. Should the surface or cover of the belt suffer abrasion or wear away, a compostion made up of equal parts of red lead, black lead, French yellow and litharge, mixed with boiled linseed oil and Japan enough to make it dry quickly, may be applied and will, under such circumstances prolong its life.

Care and Operation of Fan Blast Heating Sets.

Fan blast heating sets are usually intelligently designed and installed, and then are more often left in some remote portion of a structure for occasional operation by various occupants who may have but little knowledge or skill in the proper handling of such apparatus.

It is therefore advisable to issue instructions, these to be made out somewhat in the following order and posted in a conspicuous location free from dust or smoke. A light frame and glass cover will insure their permanency.

Instructions for operating and maintaining heating system at engine houses and shops

Gauges.—The low-pressure gauge in the fan room must be kept in good condition. Make certain at all times that it indicates the correct pressure in the low pressure steam main.

Back pressure valve—The back-pressure valve to the exhaust head should be set to open when the low-pressure gauge shows 4 lbs. pressure. See that this valve works freely and seats properly. No steam should show at the exhaust head when the low-pressure steam gauge shows less than 4 lbs.

Pressure-reducing valve—Adjust this valve to maintain the pressure of 3 lbs on the low-pressure steam gauge. If this gauge shows zero, something is wrong, either with the gauge or the reducing valve, and this trouble must be located and corrected.

Return system—The valves in the return system must not be throttled down, and it is of the utmost importance to see that the return pump is working properly at all times and that the heaters are freed of condensation as fast as this accumulates.

Fans and fan engine—Fan engine is designed to operate at a pressure up to 120 lbs. The speeds of the fan must be regulated in accordance with the weather conditions.

Steam regulating valves on heater—Supply valves on manifold leading to sections in the heater should be throttled during mild weather, as indicated below.

Operation for outside temperature above 30° *F.* Steam valves on heater one-half open and speed of fan 75 R. P. M.

Operation for outside temperatures from 20° *to* 30° F.—Steam valves on heater three-quarters open and speed of fan 85 R. P. M.

Operation for outside temperature from zero to 20° *F.*—Steam valves to heater wide open and speed of fan 100 R. P. M.

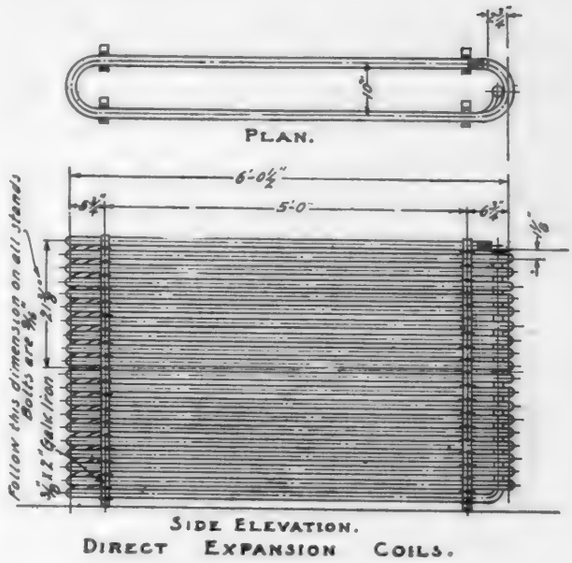
Note—As such points where the outside temperature remains at or near zero the greatest portion of the winter season, steam valves on heaters must be left wide open and the maximum speed of the fan maintained during the extremely low outside temperatures. In order to obtain the most satisfactory results, when outside temperature is below zero, the door between the building and fan room and the back doors of the heater casing should be left open so that part of the air may be re-circulated, instead of using the extremely cold air from outside. When this is done the louvres must be closed up and canvased to prevent outside air getting to casing in too great a volume.

Important—When the heating season is over, it is of the greatest importance to see that the heating system is properly laid up. After steam has been shut off to fan room, heaters must be properly drained and freed of all

condensation. Return pump in fan room must be taken apart, properly cleaned up, re-packed, valves examined and left in first-class condition for next season. All of the steam valves in the fan room must be properly packed and otherwise put in good condition. The back-pressure valve and reducing valve must be cleaned up and oiled so as to be in good shape for next season and fan casing painted. Fan engine should be gone over, all lost motion taken out and left in first-class condition.

The instructions as given above may not suit all cases but they indicate the method to be followed and the more important items which are frequently neglected.

Recirculation may be limited to brief periods or as desired using canvas for closing off the lower half portion of the louvres. This canvas can be arranged in sections convenient for handling, each section being secured in a light wood frame.

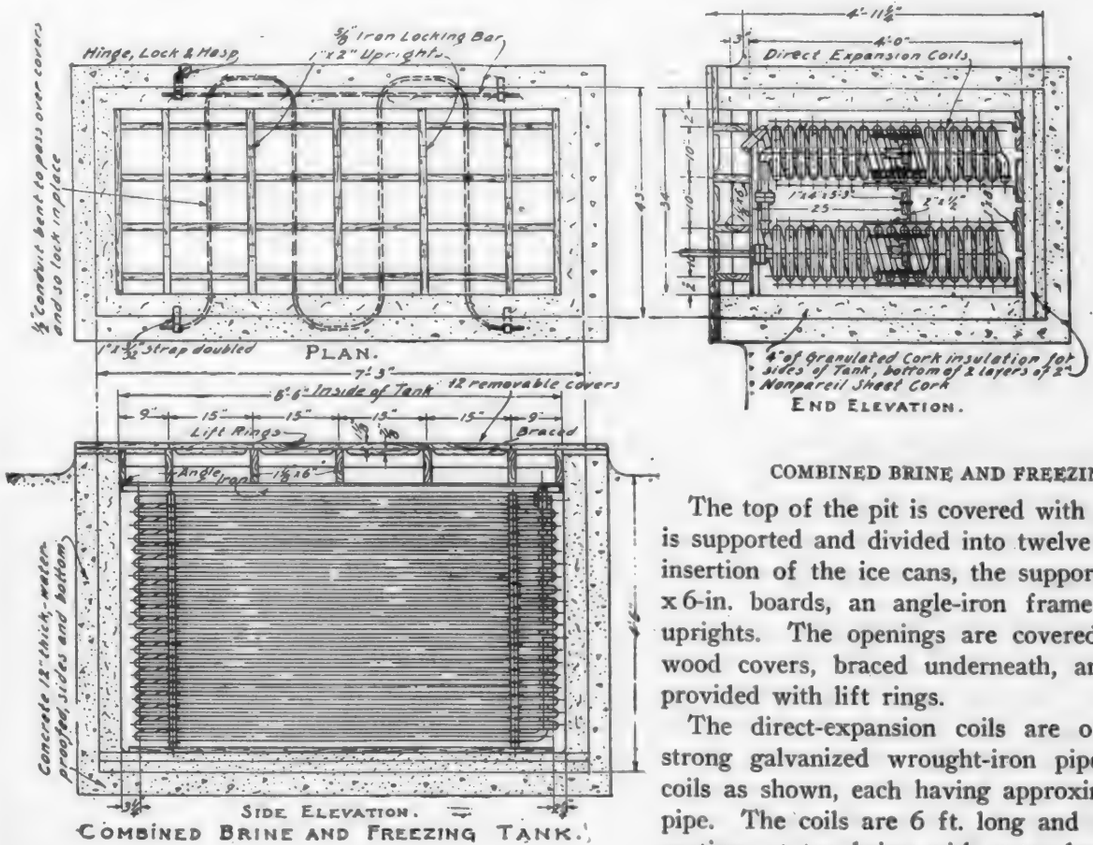


ARRANGEMENT OF DIRECT-EXPANSION COILS.

AIR COOLING AND REFRIGERATION

Combination Brine and Freezing Tank Using Direct-Expansion Ammonia Coils.

A desirable arrangement of a combination brine and freezing tank (using direct expansion ammonia coils), for making small ice blocks up to 50 lbs. in weight is shown in the accompanying sketches. An excavation is made of the size shown and a 5-ply waterproof concrete pit constructed of 12-in. sides and bottom. A brine tank, painted inside and out with waterproof paint, is installed in this pit, the size of the tank being 2 ft. 10 in. x 6 ft. 6 in. x 4 ft. 3 in. deep (inside dimensions) and made of 3/16-in. tank steel, with single riveted points. The space between the inner walls of the concrete pit and the outside of the tank is packed with 4 in. of granulated cork, and two layers of 2-in. Nonpareil sheet cork are placed under the bottom of the tank.



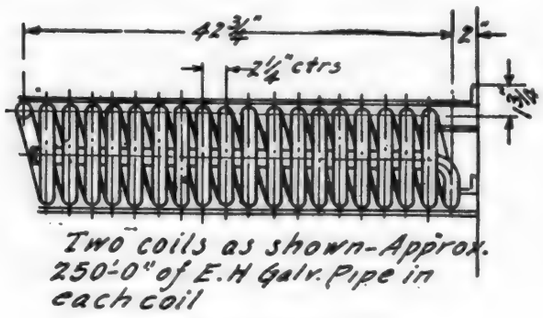
COMBINED BRINE AND FREEZING TANK.

The top of the pit is covered with planking and this is supported and divided into twelve openings for the insertion of the ice cans, the supports being 1 1/8-in. x 6-in. boards, an angle-iron frame and 1-in. x 2-in. uprights. The openings are covered with removable wood covers, braced underneath, and each cover is provided with lift rings.

The direct-expansion coils are of 1 1/4-in. extra strong galvanized wrought-iron pipe, bent into two coils as shown, each having approximately 250 ft. of pipe. The coils are 6 ft. long and 10 in. wide, connections at top being with extra heavy ammonia fit-

tings so connected as to form one continuous circuit through the tank. The coils are supported on 2-in. x 3/8-in. bolted galvanized stands, the latter resting on 1-in. x 8-in. boards, running longitudinally along the bottom of the pit.

A 2-in. x 1/2-in. iron strap is secured, one to each of these stands so as to support the 1-in. x 4-in. longitudinal boards on which the uprights, previously re-



END ELEVATION OF EXPANSION COILS.

ferred to, are placed. When assembled, the coils are installed in the brine tank far enough apart and are bent with sufficient width between turns to give clearance for the ice cans. The size of these cans is 6-in. x 12-in. x 26-in. deep, and they are made of No. 16 gauge galvanized-iron, riveted, and braced around the top opening each with an 1 1/4-in. x 1/4-in. iron strap.

Where many people have access to the tank it is often advisable to design some kind of locking device which will prevent tampering with the contents and avoid any possibility of covers being left off at pit openings so as to expose the ice to higher temperatures. Such an arrangement is shown, consisting simply of a 1/2-in. enameled conduit bent so as to pass over each of the twelve compartments and to lock in place. The two ends of the conduit are inserted into eyes as formed by iron straps bent double. On the other side of the tank a 5/8-in. iron locking bar is placed, one end of which is inserted through a strap and the other into a hinge, lock and hasp.

LEGAL DECISIONS

Warranty of Heating Plant If Any, Must be Between Parties to Contract.

A contract was made for the delivery at a building in St. Louis, Mo., of one S-36-11 Bosley boiler, which the contractor, in an action by it against the general contractor, who ordered the boiler in writing, claimed had been delivered. The defendant averred that it had a contract with the owner of the building to install a heating boiler therein, and that the plaintiff had inspected the building by its representative and advised that a boiler of the kind specified would heat the building to a temperature of 70° F. when the thermometer outside was at or below zero. It charged the boiler delivered by the plaintiff failed to heat the rooms of the building to a temperature of 70°, and that it could not be made to do so, and so failed to perform the services which the plaintiff warranted and represented that it would do; that the proprietor of the building removed it, placed it in an alley adjoining the building, and the defendant notified the plaintiff of these things, and the defendant had also notified the plaintiff to take charge of the boiler as its property, which the plaintiff refused to do; that in order to protect it, the defendant placed the boiler in storage, subject to the plaintiff's order, where it had remained ever since. A trial resulted in a verdict and judgment in favor of the plaintiff for the contract price of the boiler, with interest and costs. The defendant appealed.

There was no warranty of the boiler in the defendant's written order, which was accepted by the plaintiff verbally. It was held that the defendant, setting up breach of warranty, could not show that the plaintiff had made statements that would constitute a warranty to the owner of the building. The contract was not made with the latter, but with the defendant corporation, which presumably had a contract for placing the heating appliances in the building. If the defendant did not comply with that contract it would be a matter between it and the owner, but as between the plaintiff and defendant, if the plaintiff was to be held on a warranty, the warranty must come from the plaintiff to the defendant. Judgment for the plaintiff was affirmed. William Murdock Electric Mfg. Co. v. Elliott & Barry Eng. Co. (Mo.) 207 S. W. 877.

Rights and Remedies of Contractor Installing Heating and Ventilating Plant Under Contracts in Excess of Debt Limit.

An interesting case has recently been decided by the Utah Supreme Court, Moc v. Millard County School District, 179 Pac. 980, relating to the rights and remedies of the contractor installing heating and ventilating plants in the buildings of a county, district, municipal corporation, or other similar public body, where the authorized debt limit has been exceeded and the work and material have been used and incorporated in the buildings. The action was by the assignee of two such contractors, against a school district, and sought payment of balances due, or that, upon payment to the school district of all moneys paid on account of the installation, with interest, it turn over to the plaintiff all of the property installed which could be removed from the school building without unreasonably injuring the building, together with a reasonable rental from the time of installation until delivery. The defendant admitted the contracts, averred that they

were beyond its debt limit at the time when made, and were therefore null and void; alleged that the property was permanently affixed to the building, of which it constituted an essential part, and that it had lost its status as personal property and become real property; that it was not removable without material injury to the building, nor without destroying its usefulness as a school building, that if removed the school would have to close, and that by installing it as was done, with full knowledge and without fraud, the plaintiff was estopped from claiming or removing it.

It was held that, although under Utah Constitution, art. 14, §3, and Comp. Laws, 1907, § 1875, a contract for the installation of fixtures in a schoolhouse entered into with a school district which has exceeded its constitutional debt limit is void, the seller is entitled to rescind and remove the fixtures so far as that can be done without materially injuring the building. In such a case the ordinary rule as to fixtures does not apply. To hold otherwise would permit a very salutary provision of law to be used by the school district as a means to acquire something for nothing.

The chief difficulty with this case was to determine just what the judgment should be in view of the fact that a part of the purchase price had been paid and that some of the property which remained unpaid for was not removable without injuring the building. True, the plaintiff offered to repay that portion of the purchase price which was paid, but in doing that he demanded that he be allowed or paid a reasonable amount for the use of the property which had been used in the building. The court did not see the necessity of refunding the money that had been so paid. To that extent the contract had been executed, and there certainly was no good reason why in equity that matter should be reopened. Nor was it necessary to do that in order to do justice between the parties. If there were but one article that had been sold, or the articles were so united that they would have to be treated as an entirety, then, in order to reflect full justice, if the plaintiff were given the right to remove and repossess himself of all he had sold, he should also be required to refund what he had received. In this case, however, there were many articles, some of which could be removed while others could not. The only question therefore was: To what extent should the plaintiff be permitted to remove his property? In the court's judgment he should only be permitted to remove so much thereof in value as had not been paid for. Under the evidence, however, the court could not say just what part of the property could be removed and what part could not. Nor could it say what part of the property the plaintiff should be permitted to remove in order to prevent injustice, nor, if any, what sum he should receive as compensation for the use of his property. The court suggested that the parties might now adjust the matter amicably, and might agree either on what property should be removed or what the defendant would purchase and pay a reasonable value for, the value to be fixed as of the date of the purchase. Of course, if the parties should agree and fix the value as of the date suggested, or if the court should fix the value as of that date, the question respecting compensation for the use of the property would be entirely eliminated from the case, since the plaintiff would then be paid in full for the reasonable value of the property with legal interest.

The judgment was reversed, for further evidence, if necessary; in case the parties could not agree, as suggested to permit the plaintiff to remove so much of the property as could be removed without substantial injury to the building as might be necessary to compensate him for the unpaid purchase price with legal interest, specifying the particular articles that might be so removed and fixing their valuation as suggested.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Committee to Investigate Steam and Return Main Sizes.

An important committee has been named by the council of the heating engineers' society to investigate and report upon steam and return main sizes. It is made up equally of university professors, consulting engineers, contracting engineers and manufacturers. The full personnel is as follows:

J. A. Donnelly, chairman; S. E. Dibble, L. A. Harding, J. D. Hoffman, A. C. Willard, E. D. Densmore, R. C. Collamore, W. S. Timmis, Perry West, S. R. Lewis, W. H. Driscoll, H. M. Hart, G. B. Nichols, F. D. B. Ingalls, W. K. Simpson and M. F. Miller.

Research Work Discussed by New York Chapter.

An insight into the work being done by the National Research Council and the plans on foot at the New York University for conducting research work in heating, in connection with the university's new Engineering Building, provided an evening of more than usual interest on the occasion of the February meeting of the New York Chapter, held at the Building Trades Club, February 16. A timely matter of considerable importance was brought up when Vice-President W. L. Fleisher told of the new "proposal form" about to be put out by the Heating and Piping Contractors' National Association and which contained a provision that any test of heating apparatus should conform to the rules of the American Society of Heating and Ventilating Engineers. As the society at present has no such rules, Mr. Fleisher suggested the appointment of a committee to take up the matter. The suggestion met with enthusiastic approval.

The speakers of the evening Comfort Adams, chairman of the Engineering Division of the National Research Council; Professor Collins P. Bliss of New York University and James A. Donnelly. Mr. Adams spoke at length of the work of the Council in Washington

which has assumed very large proportions. As an instance of the need of such an organization, he cited the fact that there are at present no less than fourteen different "standard" sets of symbols for electrical work. He said every industry is in need of research work and he endorsed the proposal for standardizing tests of heating and ventilating apparatus.

Mr. Adams characterized most of engineering education as falling far short of the mark. He said the engineering schools were trying to get the student into the higher realms of engineering too quickly and were not giving enough attention to the fundamentals. "Give me a student thoroughly grounded in fundamentals," he said, "who knows how to think, and he will quickly get the technique of his profession." He thought there was too much specialization in engineering schools and that young men should be trained more thoroughly in the "habit of thought." He endorsed the movement for co-operative industrial research in which the colleges are working directly with the industries. In that way, science is being brought to the aid of industry. He said the National Research Council, which is endowed through the Carnegie Foundation, will shortly build a home in Washington, to cost $1,000,000. The actual research work is financed by each industry interested.

Professor Bliss said one of the greatest results of the war, as far as the universities are concerned, was the mingling of the faculty with the industries. He endorsed the statements of Mr. Adams, stating that the best place to learn shop methods is in the shop. Almost every engineering school, he added, is changing its curriculum in accordance with the new ideas, laying more emphasis than heretofore on fundamentals.

He said the new Engineering Building going up at New York University would cost $250,000 while the gifts of machinery and other apparatus already donated would come to another $100,000. In line with the movement to get better-trained men, an effort is being made to get the large industries to send some of their picked men to the university, providing scholarships for them, the student, in return, to conduct research work for that particular industry.

The New York University, said Professor Bliss, is desirous of co-operating with the heating engineers and, if desired, will build a "constant temperature" room in its new building. It is also planned to install three different types of heating systems in this building, so arranged that comparative tests can be made. The building will be 56 ft. x 120 ft. and three stories high.

James A. Donnelly proposed a standing chapter Committee on Research. He suggested that a week each year be designated by the society's Research Bureau as New York Chapter week, and that other weeks be assigned to the other chapters. Much field research work, he said, can be done by the members with recording thermometers and pressure gauges of a nature that the bureau cannot do in a laboratory. Recording room thermometers may be used for determining the air leakage of a building and the quality of building construction through a study of the heating and cooling curves. One placed on the top floor and one on a lower floor, for instance, will be helpful in determining roof losses. Recording pressure gauges on risers and mains often show, by a jagged record line, that the piping is not properly dripped.

Mr. Donnelly urged co-operation with the New York Trade School and similar institutions. He said the heating and ventilating class, conducted in past years by C. A. Fuller, would be started again.

Mr. Donnelly's suggestion for the appointment of a committee of five to co-operate with the society's Committee on Research was adopted.

The proposal for a national Department of Public Works in Washington was indorsed by the chapter and the members were urged to attend the meeting to further the movement which was held February 19 at the Engineering Societies Building.

In connection with routine business, a nominating committee was appointed, headed by Arthur Ritter. William H. Driscoll reported for the Entertainment Committee of the chapter which was in charge of the entertainment features at the society's annual meeting. The fund raised amounted to $401.50 which met expenses with a slight balance left over. Mr. Driscoll suggested that hereafter the society, instead of the chapter, should conduct the annual dinner and it was recommended by the chapter that this be done.

Secretary C. W. Obert, of the society, reported that the total registration at the society's annual meeting was 305, of whom 154 were members. This, he said, made the meeting the largest the society has ever held.

Mr. Fleisher then submitted the proposal to have the society prepare a standard code for testing heating plants which could be incorporated in the standard proposal sheet being published by the master steam fitters' association. His suggestion was that each chapter should delegate someone to present the idea of that chapter or locality on the proper procedure, the council of the society to take up the suggestions brought out and prepare a report for adoption at the society's next semi-annual meeting. It was voted to appoint a committee of three to proceed with the suggestion.

Illinois Chapter Takes up Smoke Abatement.

"The Fight for a Smokeless City," was the subject for discussion at the January meeting of the Illinois Chapter, held February 9 at the Engineers' Club, Chicago. The subject was presented by Dr. E. Vernon Hill, inspector in charge of the Division of Ventilation of the Chicago Department of Health, who has just been elected president of the American Society of Heating and Ventilating Engineers. Dr. Hill told of the ravaging plagues of the early centuries of cizilization that swept away millions of people. It was learned through bitter experience, he said, that the soil, and food and water must be kept clean. Today we keep these three sources of life clean, but we neglect one of the most essential, air.

Dr. Hill stated that there were three phases to the smoke problem; first, the fuel question; second, the construction of the heating plant; and third, the matter of operation. The use of anthracite, of course, would eliminate the smoke nuisance, "but," said Dr. Hill, "we have a large supply of bituminous coal at our very door and we must use it. We can use it and still rid ourselves of the smoke problem."

He proposed the erection by the city of plants for the production of gas and semi-coke. This would give a smokeless fuel which could be sold to the consumer for $6.00 per ton and through the sale of the by-products the city could realize a profit of $15.00 from each ton of coal, the original cost being considerably below that figure.

Henry Misiscow, engineer for the Smoke Division of the Chicago Department of Health, gave an illustrated talk, showing various constructions of heating plants designed to reduce the percentage of smoke produced.

These, however, he said, are only temporary meas-

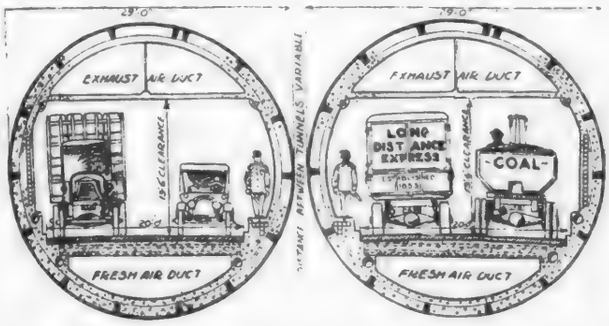
ures, and he endorsed the suggestion of Dr. Hill for the use of coke, or possibly gas, supplied by a municipally-owned gas plant. A motion was adopted to appoint a committee of five to co-operate with Dr. Hill in furthering this movement.

The meeting was opened by President John Howatt. Major William H. Chenoweth, Jr. made a report on the society's annual meeting in New York, characterizing it as the finest meeting in the history of the organization. The meeting was then turned over to the chairman of the evening, Fred W. Powers.

Secretary Nelson announced that the March meeting would be devoted to the subject of "Steam Meters." It will be in charge of a committee headed by R. A. Widdicombe and the speakers will include Ervin G. Bailey, of the Bailey Meter Company.

New Plan for Hudson River Vehicular Tunnel.

Finally discarding the plan tentatively adopted over a year ago (published in THE HEATING AND VENTILATING MAGAZINE for April, 1918) for a vehicular tunnel under the Hudson River the New York State Bridge and Tunnel Commission has submitted a new plan, which is illustrated herewith. The proposed tunnel will cost $28,669,000 and is radically different from the Goethals double-decked concrete $12,000,000 tunnel previously proposed. The Goethals plan was turned down on the ground that the capacity of that type of tunnel was overestimated and was not sufficient to accommodate three lines of traffic. Also it was felt that the lining of concrete blocks proposed was not of sufficient strength, and the estimated cost was considered too low.



NEW SCHEME FOR HUDSON RIVER TUNNEL SHOWING AIR DUCTS.

The ventilation of the new form of tunnel will be by means of steel shafts, sunk between the pierhead and the bulkhead lines on each shore, from which fans will be operated. It will be noted that the scheme for ventilation provides for the admission of the fresh air underneath the roadway, while the exhaust air ducts are carried along the roof of the tunnel. The tubes will be about 8500 ft. long, the under-water portion between bulk-heads being 3800 ft., while the distance at each terminal, from bulk-head to entrance, will range from 1800 to 2500 ft.

In the Goethals plan the fresh air duct ran along the top of the tunnel, the air discharging downward.

The "Hand" of a Fan.

A statement in Standard Data Sheet No. 136, published in THE HEATING AND VENTILATING MAGAZINE for December, 1919, regarding the "hand" of a fan has brought out the fact that manufacturers are not agreed upon the manner of designating the "hand."

In the Data Sheet referred to, it was stated that the hand of a fan is that which designates upon which side of the casing the pulley or other driving apparatus is located, when one is facing the outlet of the fan. A right-hand fan is one having the pulley, engine, turbine or motor on the right as one faces the outlet, and a left-hand fan is one having the pulley engine, turbine or motor on the left as one faces the outlet. An exception to the above occurs when the pulley, engine, turbine or motor is placed in the inlet of a single-inlet fan, in which case the housing itself may be left-hand, and yet the pulley, engine, turbine or motor may be on the right. In such cases, which are very infrequent, and usually impracticable, full explanation should be given to avoid confusion.

With up or down angular discharge, also, the hand is determined by the location of the motor, turbine, pulley or engine, when the observer stands at the discharge end of the fan.

Attention is called to the fact that other manufacturers determine the "hand" as follows:

Standing on the driving side, looking parallel with the shaft, if the discharge is on the right-hand side of the shaft, it is a right-hand fan; if on the left, it is a left-and fan. This method has the advantage of avoiding any confusion such as is possible with the first-named method, regardless of the angularity of the discharge or whether it is up or down. Neither is there any confusion whether the motive power is on the inlet side or the opposite side of the fan.

Supplying Moisture to the Air.

Some simple suggestions for moistening the air in private houses are contained in a recent publication of the Engineering Extension Department of the Iowa State College of Agriculture and Mechanic Arts, at Ames, Ia. The author, K. G. Smith, states, among other things:

The moisture required in cold weather to keep up the humidity in houses is more than is generally realized. If the temperature is zero and the outdoor humidity at the average of 70%, it requires about 1 gal. of water every twelve hours to properly moisten the air required by one person when it is warmed to a room temperature of 70° F. The moisture must be supplied to the air in the form of vapor or steam.

To evaporate water with sufficient rapidity to supply this moisture requires either a large surface, a high temperature, or both. Pans which hang on the back of a radiator do not have a large surface and are not highly heated, hence they are not very effective. A small tube attached direct to the radiator and discharging steam into the room is also used. This supplies vapor faster than the pans providing there is steam pressure. Some persons dislike the slight noise and the odor from escaping steam. One of the most effective pans made has a water space in the middle and a wick to give a large evaporating surface. If kept full of warm water, these pans evaporate a surprising amount.

No one has yet devised a satisfactory method of moistening the air in houses heated by water; the radiator temperature is too low to evaporate rapidly from pans, and no steam is available.

Pans may be made somewhat more effectively by placing sheets of blotting paper or asbestos beneath them and punching a needle hole in the bottom of the pan. The paper absorbs the water and increases the evaporating

surface. The difficulty with this arrangement is to control the flow of water. Another method is to make a wick of blotting paper or asbestos and let one end rest in the water pan and the other hang down over the radiator. Water will be carried upward a short distance and over the edge of the pan as oil is lifted by a lamp wick.

In a warm air furnace the problem is simple. The heater is in the basement and all that is necessary is a pan of water properly placed upon it inside the jacket. The water pan in any furnace should be of good size and set well up into the warm air space so as to make evaporation as rapid as possible. A small water pan set low down in the furnace has practically no effect. Many modern furnaces are fitted with satisfactory humidifiers automatically controlled.

A furnace with a small or unsatisfactory pan may be fitted up with a home-made pan in the following manner: Cut a hole in the front of the jacket with a pair of tin snips and insert a good-sized shallow pan directly above the heating surface. Make an inlet and overflow connection, close the hole and cover with asbestos. No solder should be used on the pan or connections and it should be heavy enough to resist rusting and corrosion. A heavy cast-iron skilet is quite satisfactory. The pan should be supported so that the bottom is not less than 1½ in. above the top of the furnace or it will impede the air circulation and cause the furnace to burn through at this point. Keep the pan full or nearly full of water all the time.

Another method, devised by Professor W. H. Meeker of Iowa State College, which does not involve so much cutting is the following: Cut a slot 4 in. long and ½ in. wide, with the long dimension horizontal, near the top of the furnace jacket and directly over the water pan. Fold a piece of wire netting 8 in. wide and 4 ft. long through the center and insert between the two layers a sheet of asbestos folded the same way. Sew up the open side of the netting. Slip this wick through the slot in the casing and draw the lower end into the water pan at the bottom. Open the upper end as a funnel and directly above it install a small pet cock connected to the water supply. Allow water to drip upon the wick fast enough to supply the necessary moisture. In mild weather less is needed than in cold weather.

How Overheated Houses Waste Coal.

A statement that a house kept at a temperature of 75° F. uses 25% more coal than one at 68° F. recalls a bulletin issued during the war by the War Committee of the University of Illinois. In this bulletin two homes were shown, as illustrated in Figs. 1 and 2. The houses were supposed to be located in a section where the average outside

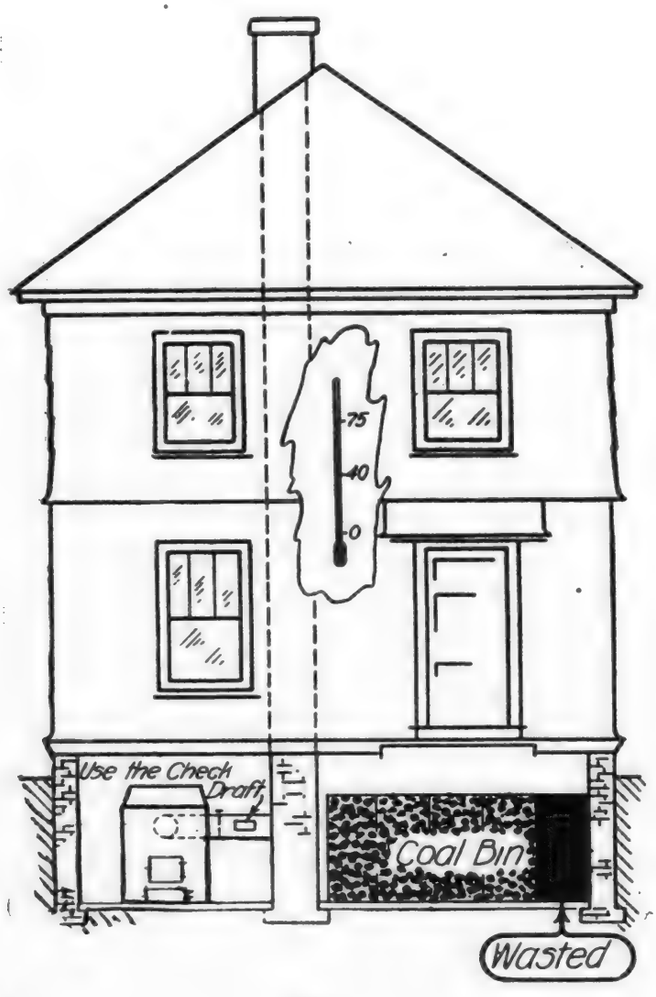


FIG. 1.

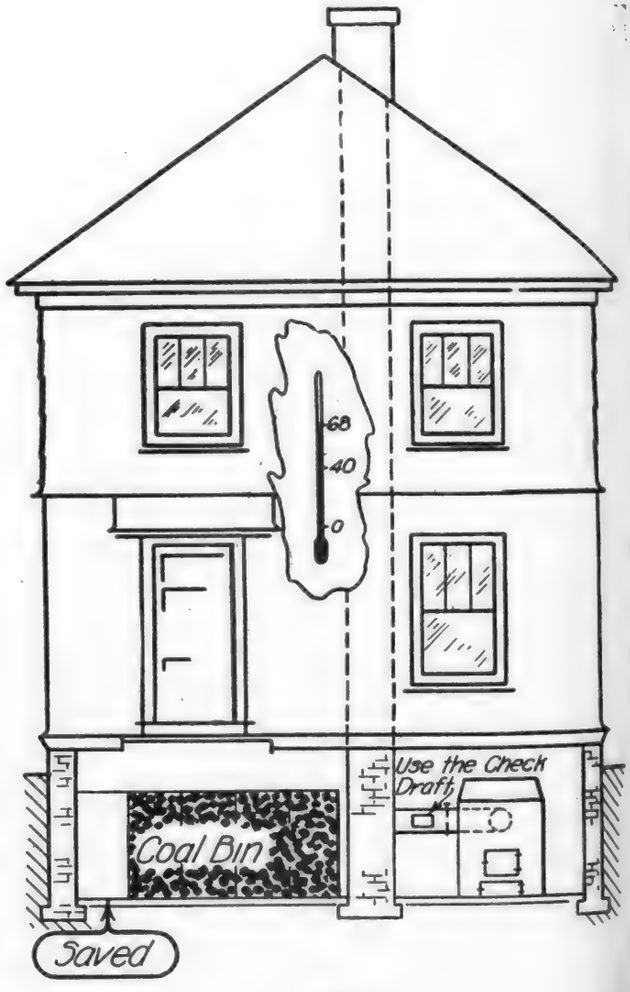


FIG. 2.

HOW OVERHEATED HOUSES WASTE COAL.

temperature is about 40° F. for the heating season from September 15 to May 15.

In Fig. 1 the temperature maintained of 75° indicates a waste of coal because the average temperature difference is 75 — 40, or 35°, whereas it should be only 28°. In Fig. 2 the average temperature difference is only 68 — 40, or 28°. The temperature difference between the two houses is 7° showing that a house overheated in the manner indicated burns 25% more coal than the other house.

The moral drawn is: "Watch the thermometer. Learn to use the check draft and keep the house at 68° F.

New Method of Dehydrating Food.

Recent advances in the drying of foodstuffs by the vacuum method were described by Dr. K. George Falk, of the Harriman Research Laboratory, Roosevelt Hospital, New York, before the New York Section of the American Chemical Society. He announced that, following the experimental stage in this process, meats and vegetables had been thoroughly dried in the Industrial Chemistry Laboratory of Columbia University under the supervision of Professor Ralph H. McKee and had been shipped to different parts of the world, where they have been used with success. One consignment of the meat dried in this manner gave great satisfaction in Armenia, where it was distributed by the Near East Relief Fund. Other products of the new dehydration process had been taken to distant parts of the world by exploring parties and had been found to answer all the requirements.

It would be possible by means of this process to dry beef in vacuum ovens in parts of the earth where cattle may be raised very cheaply, as in Argentina, and to transport the dried product for many thousands of miles at very low freight cost. As canned fruits contain considerable moisture and are placed in metal containers, the advantages of the vacuum-dried products become manifest, according to the view of Dr. Falk.

"Transportation," said he, "has always been a question of vital importance. Ships and other common carriers are always at a premium and again certain kinds of food require special equipment, such as cold storage. For example, the plentiful supply of sheep in New Zealand might benefit the rest of the world to a greater extent if more transportation facilities were available."

Dr. Falk said that usually sun-dried meats and other foods were discolored and that their nutritive values were impaired. While even with fairly good methods of dehydration it would have been found necessary to use bleaching agents, a recourse which was not required, according to the process developed at the Harriman laboratories. The incentive to develop this method of preservation for food products was given early in November, 1917, by Colonel John R. Murlin, in charge of the Division of Food and Nutrition of the U. S. Army, and was developed by Dr. Falk, Dr. Edward M. Frankel and Professor Ralph H. McKee.

"In the dehydration of meats," said Dr. Falk, "the temperature must be kept below the point at which the proteins coagulate, for if there is too low a temperature the process of dehydration will be unnecessarily prolonged, with the result that often spoilage will occur and the overhead cost will be greatly increased. It is possible to solve this problem of dehydration by the use of a suitable vacuum drier in which the meat or other food product is introduced, in pieces of suitable size, and kept in the vacuum at a temperature which is below that of cooking or which makes no appreciable change."

Dr. Falk said that a large variety of foods had been dehydrated by the vacuum method and that a number of others will probably be subjected in time to the same process. The mechanism used is not complicated and can be easily installed at remote places.

"In considering food preservation methods in general, it may be stated," he said, "that such methods will come into use more and more." The Government estimated that 50% of the fruits and vegetables grown in this country never reach the consumer as a result of poor transportation facilities, irregularities in marketing or other causes. At the same time, greatly because of recent work on such questions as food hormones, the tendency is to use fresh foods wherever possible. The newer dehydration processes approach more nearly the requisite standards of fresh foods than do the older methods of preservation. The whole question is in a state of development. Dehydration offers the most promising outlook for the future. Air dehydration marks a great advance over the older methods of food preservation, and it would appear that vacuum dehydration possesses in its turn advantages over air dehydration.

Secondary Rates Proposed for House Heating With Gas.

House heating with gas, is treated in detail in a special number of *The Gas Age*, New York, which has just been issued. Any standard system of heating, such as steam, water, vapor, vacuum or warm air, may be used with a gas boiler or gas furnace, as the case may be. Installations in various parts of the country, together with cost and consumption figures taken from actual experience, are given in detail. The effect of various rates charged in different cities, such as block rates, secondary rates, special rates and regular rates on the cost of heating with gas, is also given. *The Gas Age* is advocating the adoption of secondary rates for gas for house heating, which would bring the cost of artificial gas below that of coal.

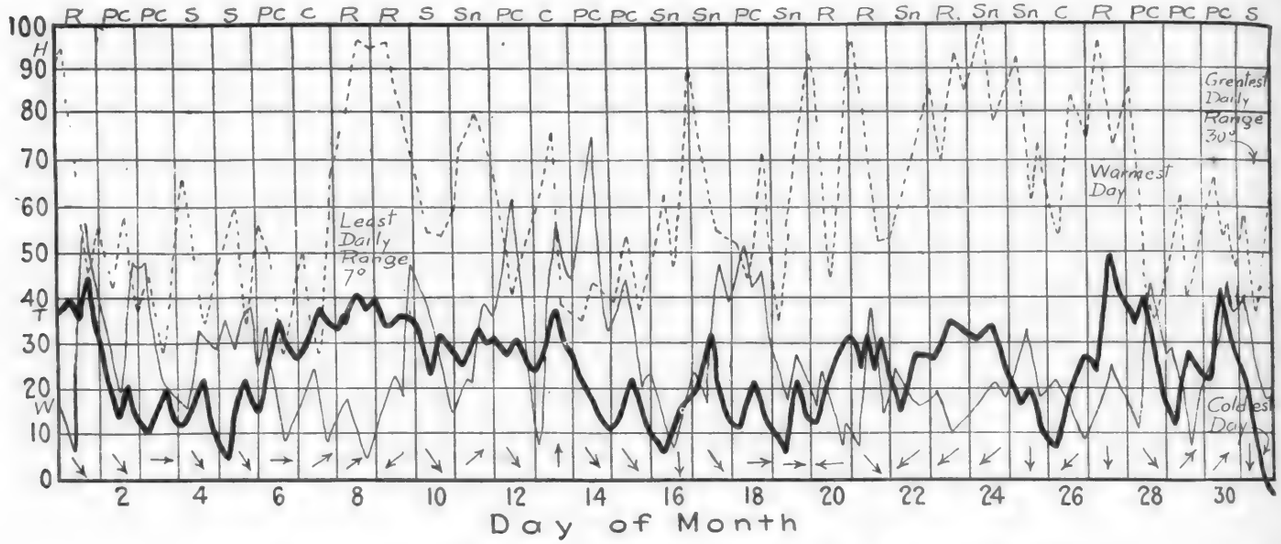
Notice to Correspondents.

Inquiries in connection with heating and ventilating problems are welcomed by the editor, but our correspondents can save the editor's time and make their questions easier to answer by observing the following directions:

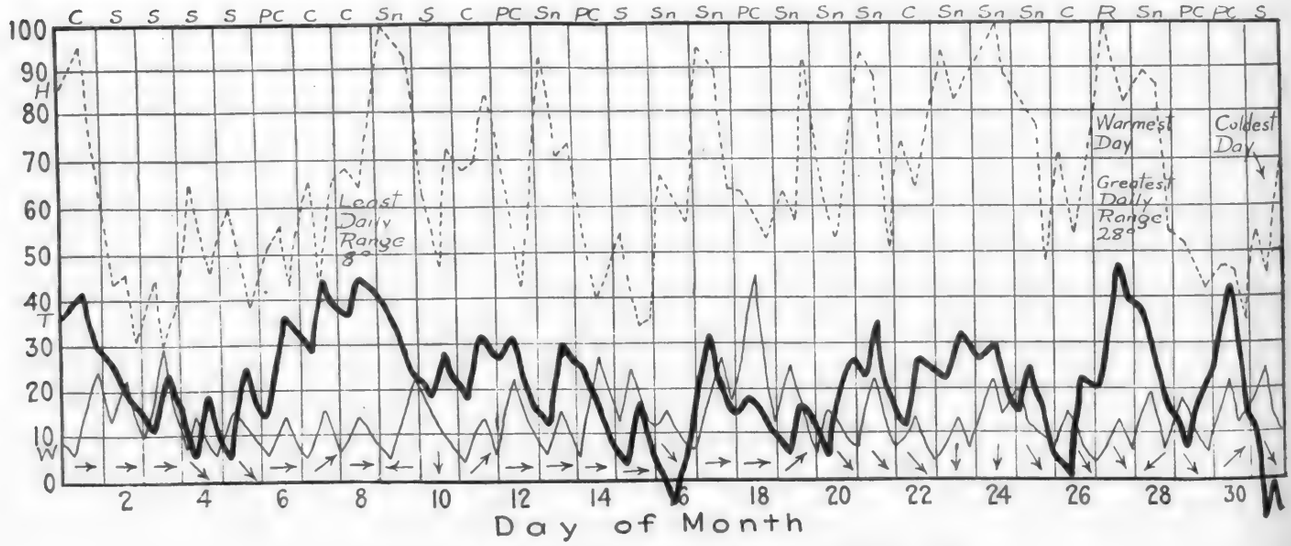
Be specific, giving all necessary sizes, ratings and capacities which affect the conditions under consideration. Make liberal use of illustrations. Clear drawings add to the value of the contribution. If you have no time to make a finished drawing, make a rough, but fully-dimensioned, sketch that will convey the idea to our artist. Failure to conform with the above unfortunately compels us to eliminate or delay the publication of many questions which are otherwise desirable. A fulfillment of these conditions will serve the interest of all concerned and make possible a prompt acknowledgment and solution of the problem, which will be forwarded, when desired, prior to publication.

THE WEATHER FOR JANUARY, 1920

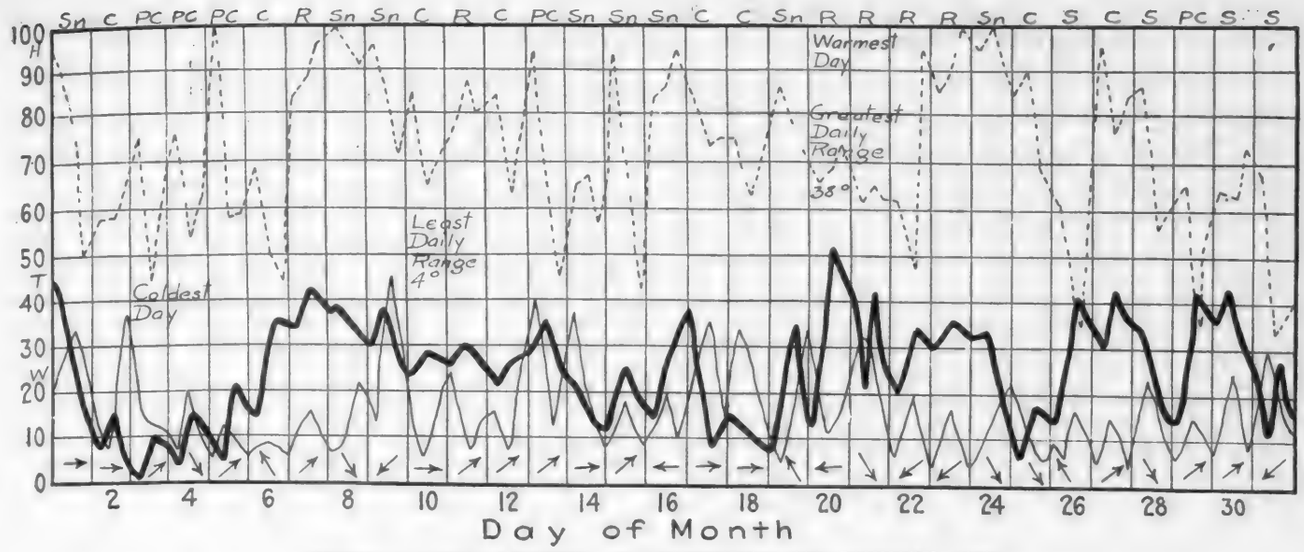
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	49	48	52	38	55
Date of highest temperature	27	27	20	29	30
Lowest temperature, degrees F.	–3	–8	1	–5	5
Date of lowest temperature	31	31	3	2	4
Greatest daily range, degrees F.	30	28	38	23	26
Date of greatest daily range	31	27	20	26	20
Least daily range, degrees F.	7	8	4	4	6
Date of least daily range	8	8	10	23	31
Normal temp. for month, degrees F.	24.1	21	24	18.8	28.4
Normal mean temp. for month, degrees F.	30.2	27	30.7	23.7	31
Total rainfall, in.	2.23	2.72	2.8	1.11	1.85
Total snowfall, in.	7.8	24.8	11.1	12	9.3
Normal precipitation, this month, in.	3.79	3.82	2.87	2	2.27
Total wind movement, miles	14926	8328	9728	10018	9400
Average hourly wind velocity, miles	20.1	11.2	13.1	13.5	12.6
Prevailing direction of wind	N. W.	W.	S. W.	N.W.	N. W.
Number of clear days	4	7	4	8	15
Number of partly cloudy days	12	10	8	9	6
Number of cloudy days	15	14	19	14	10
Number of days on which rain fell	6	5	7	1	6
Number of days on which snow fell	7	11	8	10	4
Snow on ground at end of month, in.	1.6	10.4	Trace	1	Trace



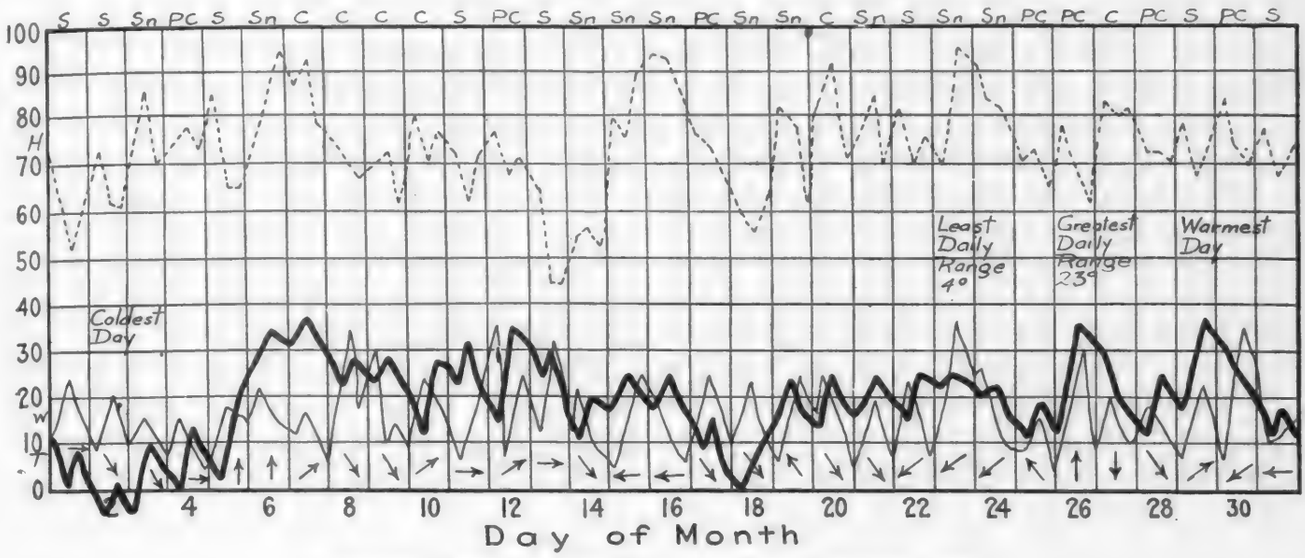
RECORD OF THE WEATHER IN NEW YORK FOR JANUARY, 1920. (RELATIVE HUMIDITY PLOTTED FROM HOURLY OBSERVATIONS



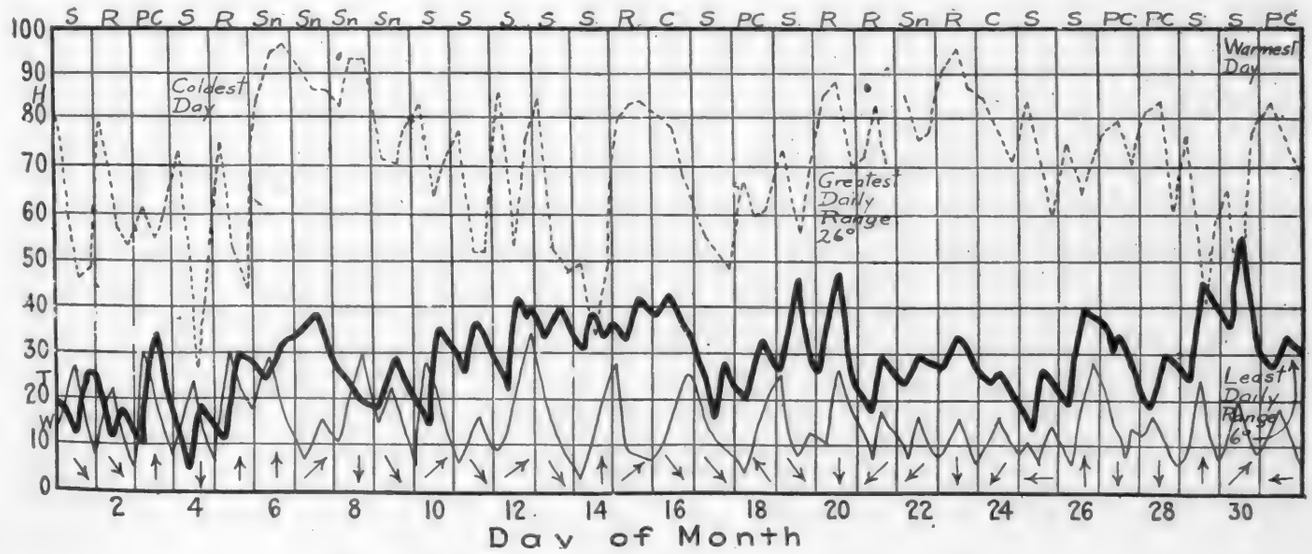
RECORD OF THE WEATHER IN BOSTON FOR JANUARY, 1920.



RECORD OF THE WEATHER IN PITTSBURGH FOR JANUARY, 1920.



RECORD OF THE WEATHER IN CHICAGO FOR JANUARY, 1920.



RECORD OF THE WEATHER IN ST. LOUIS FOR JANUARY, 1920.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings taken at 8 A. M., 12 M., and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

Proposed Code for Installing and Operating Refrigerating Plants.

An important step towards safe practice in the design of refrigeration machines and plants has been taken by the American Society of Refrigeration Engineers in developing a code designed to be enacted into law by city and State governing bodies. The special purpose of the code is to provide for the safe installation and operation of such plants.

The principal items of the code, outside of the legal data and phrases necessary, have been condensed by *Power Plant Engineering* as follows:

Section 1 states the application to every refrigerating machine using ammonia, carbon dioxide, ethyl chloride or sulphur dioxide as a refrigerant. The remainder of the section is concerned with definitions of "refrigerating machine;" "large," having 3 T. or more capacity or containing 100 lbs. or over of refrigerant, and "small" of less than 3 T. or having under 100 lbs.; "pressure imposing element," the compressor or absorber and generator; "safety valve," "automatic bypass valve," "liquid receiver," "cylinder," "main suction and main discharge valves," "capacity," which is taken as the builder's rating in tons refrigeration per 24 hr. These definitions are as usually understood by engineers.

Section 2 covers equipment of safety valves, one or more of which must be provided for every "large" machine, connected to the discharge line between the main discharge valve and the pressure imposing element, set to relieve excessive pressure and sealed. Sizes specified are for machines of

From 3 to 25 T. capacity, ½-in. valve.
From 26 to 60 T. capacity, ¾-in. valve.
From 61 to 100 T. capacity, 1-in. valve.
From 101 to 175 T. capacity, 1¼-in. valve.
From 176 to 250 T. capacity, 1½-in. valve.
From 251 to 450 T. capacity, 2-in. valve.
From 451 to 900 T. capacity, two 2-in. valves.

For ammonia, valves are to open at 300 lbs. or less.

For carbon dioxide, valves are to open at 1800 lbs. or less.

For ethyl chloride, valves are to open at 60 lbs. or less.

For sulphur dioxide, valves are to open at 150 lbs. or less.

AUTOMATIC BY-PASS VALVE.

Section 3 provides for an automatic by-pass valve between the main discharge valve and the pressure imposing element, recommended to be of the same size as the safety valve and set, for ammonia, at 250 lbs.; for carbon dioxide, at 1500 lbs.; for ethyl chloride, at 50 lbs.; and for sulphur dioxide at 120 lbs. Discharge will be to the suction side of the pressure imposing element.

Section 4 deals with the liquid receiver. This is to be tested by combined hydrostatic, and hammer or other approved vibratory test before being put into service, and every receiver containing 25 lbs. or more of refrigerant and having check valve, stop vavle, or both between the condenser and receiver is to have a ½-in. safety valve, with no stop valve between it and the receiver, set to discharge to atmosphere.

Pressures for test and safety valve setting are as follows:

For systems using	Test press lbs.	Safety valve setting lbs.
Ammonia	500	350
Carbon dioxide	3000	2000
Ethyl chloride	150	100
Sulphur dioxide	250	200

Sections 5 and 6 provide for fire emergency. For all machines carrying 25 lbs. or more of refrigerant, means is to be provided for discharging. For "small" machines this may be two ½-in. safety valves, one connected by an emergency line to the discharge line from the pressure imposing element between the main discharge valve and the condenser; the other is to be connected to the suction line between the evaporator and the main suction valve; both to be set for pressures as given for "large" machines in Section 2. In case ammonia is to be discharged into water, a check valve may be inserted in the emergency line to prevent water from entering the machine, but no other valve is permitted in the emergency line.

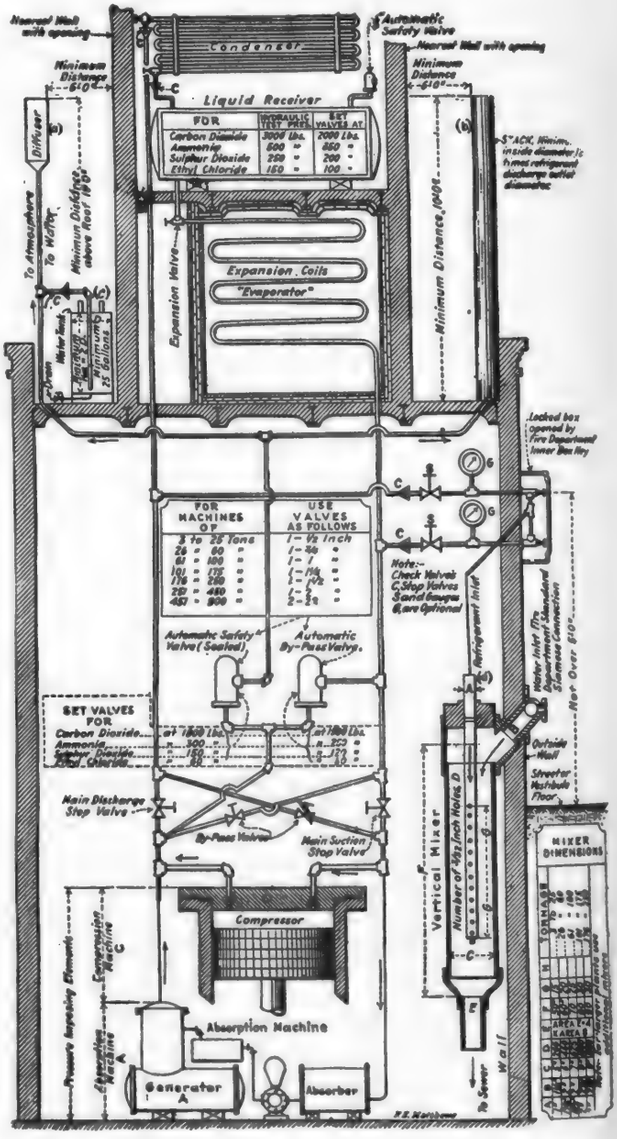


FIG. 1—DIAGRAM OF CONNECTIONS AS PRESCRIBED IN SAFETY CODE FOR A REFRIGERATION PLANT OF THREE TONS OR MORE CAPACITY.

FOR LARGE MACHINES.

For "large" machines, hand-operated valves similarly connected are to be located on the public thoroughfare side of the building wall or in a vestibule having glass panel doors giving easy access to the street. These valves must be not over 5 ft. above street or floor level, protected by a locked box to which only members of the fire department have access. But the emergency lines may have check valves, pressure gauges and auxiliary stop valves for repair purposes only, and the fire department may allow access to the locked box by those authorized to make repairs. The auxiliary stop valves are to be located inside the buildings, as near as possible to the emergency valves, and to be sealed "open," except when making repairs.

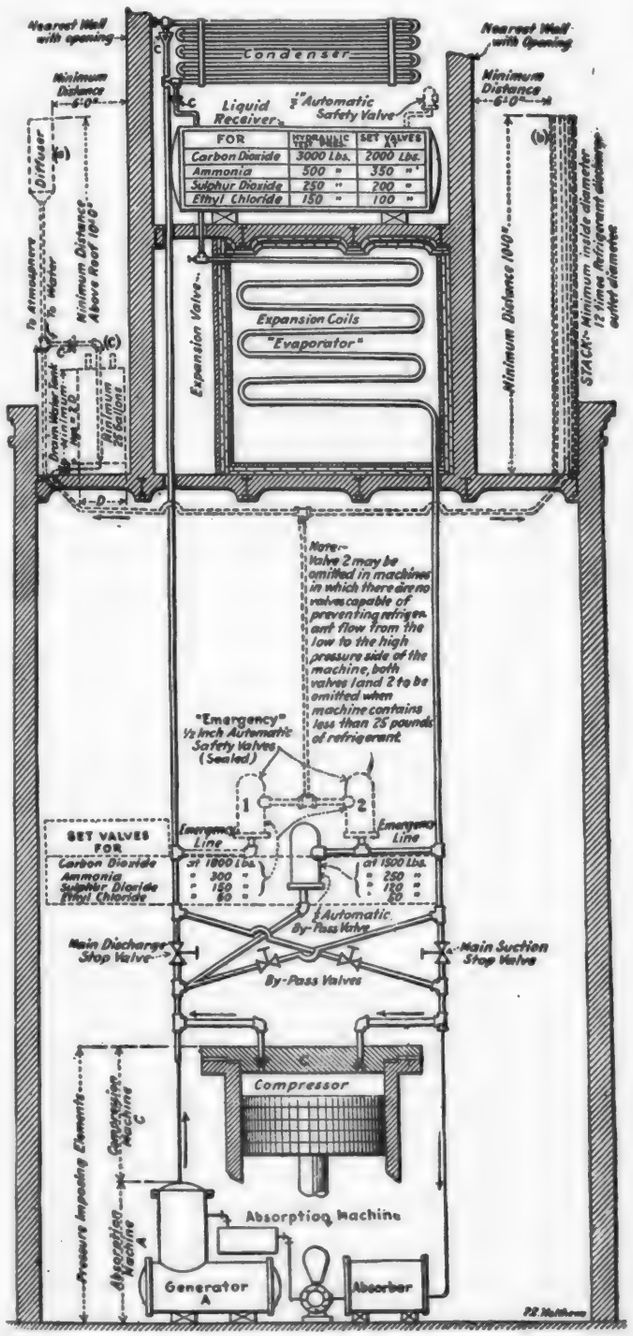

Nearest Wall with opening
Condenser
Nearest Wall with Opening
Minimum Distance 6'0"
Liquid Receiver
¾" Automatic Safety Valve
FOR
HYDRAULIC TEST VALVES
SET VALVES
Carbon Dioxide 3000 Lbs. 2000 Lbs.
Ammonia 500 " 350 "
Sulphur Dioxide 250 " 200 "
Ethyl Chloride 150 " 100 "
Diffuser
To Atmosphere
Minimum Distance Above Roof 10'0"
Expansion Valve
Expansion Coils "Evaporator"
Minimum Distance 10'0"
STACK-Minimum inside diameter 12 times Refrigerant discharge outlet diameter
Note:-Valve 2 may be omitted in machines in which there are no valves capable of preventing refrigerant flow from the low to the high pressure side of the machine, both valves 1 and 2 to be omitted when machine contains less than 25 pounds of refrigerant.
"Emergency" ½ Inch Automatic Safety Valves (Sealed)
Emergency Line
SET VALVES FOR
Carbon Dioxide at 1800 Lbs.
Ammonia " 300 "
Sulphur Dioxide " 150 "
Ethyl Chloride " 80 "
at 1500 Lbs.
" 250 "
" 170 "
" 80 "
¾ Automatic By-Pass Valve
Main Discharge Stop Valve
Main Suction Stop Valve
By-Pass Valves
Compressor
Compressor Machine
Pressure Imposing Elements
Absorption Machine
Absorption Machine
Generator
Absorber

FIG. 2.—DIAGRAM OF CONNECTIONS AS PRESCRIBED IN SAFETY CODE FOR A REFRIGERATION PLANT OF LESS THAN THREE TONS CAPACITY.

The locked box is to be labeled *"For Fire Department use only."* The high-pressure valve to be labeled, *"High Pressure Amomnia,"* and the low-pressure valve, *"Low Pressure Ammonia,"* the name of the refrigerant used being substituted where it is other than ammonia.

If ammonia is used, it is to be discharged into the sewer through a mixer as shown later, and a sign in the box must read, *"Do not open valves until water is flowing into the mixer."*

In "small" machines having no stop or check valves which can prevent flow of refrigerant to the high-pressure side, the emergency discharge-line safety valve will serve for the fire requirement and also to protect the liquid receiver, as in Section 4.

DISCHARGE OF REFRIGERANT.

Section 7 deals with the discharge of refrigerant from safety or fire emergency valves, either into atmosphere or water. When discharged to atmosphere, the refrigerant is to be carried by continuous piping to an outlet turned upward, and having a diffuser suitable to mix the gas with air without restricting the flow. The piping must be such as to impose a pressure of not over 10 lbs. on the discharge side of the safety valve, and must have no connection in any way to a steam or plumbing system nor any means whereby the gases might be ignited. The piping must not be subject to serious corrosion and the outlet must be at least 6 ft. from any wall in which there is an opening, or 10 ft. above the roof. For carbon dioxide, the diffuser may be omitted.

Discharge may be effected through a ventilating stack if its diameter is not less than 12 times that of the refrigerant outlet, and the first possible outlet of the stack satisfies the conditions given previously. No diffuser is required.

Ammonia may be discharged into a tank which contains 1 gal. of fresh water, not used for any other purpose, for every pound of ammonia contained in the machine, but in no case shall the tank contain less than 25 gal.

The tank is to have hinged cover or an inlet and a vent hole at the top, and no horizontal dimension shall be greater than half the height. The discharge line for refrigerant is to enter at the center of the bottom. The tank is to be firmly supported and braced and have a valve at the bottom for draining.

When discharged to a mixer, this is to be of vertical type of dimensions shown in Fig. 1 and having a standard fire department Siamese connection through which the fire department shall supply water under the necessary pressure.

SAFETY REGULATIONS.

Section 8 provides for helmets in such plants as may be designated by the Fire Commissioner, and Section 9 that no flames, arc lights or gas jets are to be used in refrigerating machinery rooms where ammonia or ethyl chloride are the refrigerants, except internal combustion engines with hot surface ignition which may be started and run in the usual way.

Section 10 defines provisions for escape and ventilation. All rooms for machines containing 25 lbs. or more of refrigerant must have a direct exit to the open air or to a room or hall from which gases can be excluded by self-closing doors. Vertical and horizontal openings which permit passage of gases to parts of the building not a part of the refrigerating plant must be sealed or have self-closing doors. And all rooms must have adequate ventilation to the open air direct or by means of suitable ducts.

If mechanical systems of ventilation are used the control must be easily accessible in case of fire.

Section 11 provides that cylinders containing refrigerant must be stored in a cool, well ventilated place, as remote as possible from danger by fires.

Whether required by law or not these provisions embody the best thought of refrigeration experts as to safety precautions and should be put into practice in every plant for the sake of the employees and the plant.

Heating and Piping Contractors' National Association

Date Set for Annual Convention.

Announcement is made that the next annual convention of the Heating and Piping Contractors' National Association (formerly the National Association of Master Steam and Hot Water Fitters) will be held in Cleveland, O., May 24-27, 1920. Headquarters will be at the Hotel Cleveland. This is the first time the association has chosen Cleveland for its convention and it will be one of the few times when the organization has gone to the Middle West. The choice of the lake city is in compliment to the Cleveland members who became affiliated with the national association last year.

Illness of President J. C. Hobbs of the National District Association.

An item in the *Bulletin* of the National District Heating Association for January states that President J. C. Hobbs, "who is seeking to regain his health in the mountains of New York," is making encouraging progress toward recovery and is looking forward to presiding at the next convention of the association this Spring.

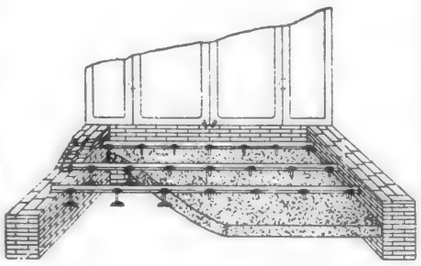
Monolith Boiler Arch—A new Design.

It has long been established that a boiler arch is of benefit to combustion in the control of the gases in a boiler, particularly boilers of medium and small rating. The presence of hot refractory material in a furnace insures higher furnace temperatures and, incidentally, more thorough mixing of the gases, at the same time preventing the escape of unburned gases. This is evidenced by the general tendency to set boilers higher, permitting the use of a large combustion chamber, with more time for the gases to mix and burn.

It has also been pointed out that a fuel surrounded by a cast-iron or steel fire-box will not burn with as high an efficiency as when a fire-brick furnace is used. There has been a great objection, however, to arches, as they mean additional maintenance cost. In many cases the arches persist in pushing out the side walls and falling down.

Such troubles have been greatly alleviated by installing flat-suspended arches which have served their purpose in not permitting the arch to drop. This type has merit, its drawbacks being the expense of replacing the blocks, especially in the center of the arch; air leakage due to large joints; expansion due to density of material and character of clay; radiation; and difficulties in fitting when the furnace is irregular.

With these difficulties in mind a one-piece, baked-in-place suspended arch has been designed by L. S. Shaw, well-known in the power field and president of L. S. Shaw & Co., Cleveland, O., which has been placed on the market under the name of Monolith boiler arch. Plastic fire brick is used and the arch is supported from beams, as shown in Fig. 1. A 3/4-in. pipe is used to suspend a ventilated disc, as shown in Fig. 2. The beams constitute the permanent support after the brick is baked in place.

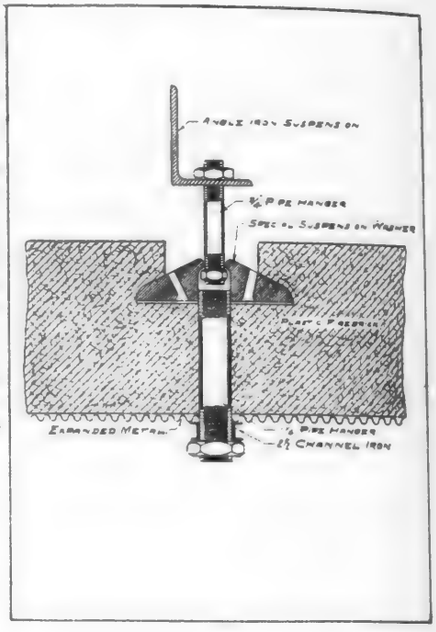


CONSTRUCTION OF SHAW MONOLITH BOILER ARCH.

Should the brick burn away so as to expose the disc, it is protected by air flowing through the pipe into the furnace.

To hold the plastic fire-brick in place until the brick is baked in place a temporary form or centering is provided, consisting of a 1 1/4-in. pipe screwed into the 8-in. disc. The pipe holds up some small channels over which expanded metal is laid. The form may be cut to fit the irregularities of the furnace, and may be also set at any angle or curvature desired and then filled with plastic fire-brick and baked in place. During the process of baking, which may be done within a few hours, air flows through the hollow bolts of the hanger, preventing the iron from getting too hot. At the first convenient time when the boiler is shut down the 1 1/4-in. pipes are screwed out of the discs and the holes plugged with plastic fire-brick.

This type of arch is described as easy to install; uses only one casting, the disc; uses brick from a barrel, with no broken brick; brick is compounded to



DETAILS OF CONSTRUCTION OF SHAW MONOLITH BOILER ARCH.

be free from expansion and contraction; brick is loaded with asbestos; brick is baked rapidly with moisture, producing a fluffy consistency which allows a slow infiltration of air, keeping down the brick temperature; arch is easy to repair, a few discs and a barrel of brick being the only requisites.

The arch is protected by United States and foreign patents.

PLANT ENGINEERING & EQUIPMENT CO., INC., NEW YORK, manufacturers of Corliss valve steam traps, Mason condensation meters, and other power and heating specialties, announces the opening of its twenty-sixth office to take care of the increased demands for its products. M. William Ehrlich, experienced in consulting and contracting engineering, will be the company's New Jersey manager in charge, with headquarters in Newark and a sub-office in Lyndhurst, N. J.

Trade Literature.

THE PART OF AIR VENTS IN STEAM HEATING PROGRESS, by J. F. Musselman, is the title of the first of a series of three publications issued by the Hoffman Specialty Co., New York. The article is one reprinted from *The Architectural Review*. It gives an account of the early attempts at air venting of radiators and the rapid progress made in recent years, both in the improvement of air valves and in the perfecting of radiator return valves. The second publication of the series contains extracts from Mr. Musselman's article, and, in parallel columns, comments written by the Hoffman Specialty Company on the way the Hoffman air valves and return line valves meet the requirements. The third publication contains a new form of guarantee adopted by this company. Size of each publication, 4 3/4 in. x 6 3/4 in. Pp. 20.

BEIGHLEE SYSTEM (COMPENSATED) OF ELECTRIC THERMOMETERS, consisting of thermo-electric pyrometers, which are described as giving the most reliable method known of measuring temperatures, is featured in a catalogue issued by the Cleveland Instrument Co., Cleveland, O., successor of the Beighlee Electric Co., of that city. After describing, in an interesting manner, the operating principle of pyrometers, details are given of the points of superiority of the Beighlee pyrometer system in connection with the temperature coefficient error, the cold-junction error and the lead resistance error. The two types of Beighlee pyrometers are then taken up, the suspension-needle type and the pivoted type, the double-pivoted type being of rugged construction for work not requiring the same accuracy as the suspension-needle type. Each type is made in several forms, such as the compensated central station pyrometer, the resistance pyrometer and the compensator recording pyrometer. The catalogue shows typical Beighlee installations, together with views of wall type and portable type of apparatus, different arrangements of thermo-couples, followed by a section on switchboards. A number of temperature charts are included, showing the wide adaptability of the Beighlee system. A guarantee is included which is declared to be the strongest ever written. Size 6 3/4 in. x 9 3/4 in. Pp. 32.

SAVE 1/4 OF YOUR COAL THIS WINTER WITH THE AEOLIPYLE is the title of a circular devoted to the Aeolipyle air-feed combustion damper, manufactured by William Buchanan, 488-492 Sumner Avenue, Brooklyn, N. Y. This device is intended to be attached to the smoke pipe and is designed to admit warm air to the combustion chamber. The air is heated as it passes through the damper. The circular quotes from government bulletins that 14 lbs of coal is needed to burn 1 lb. of coal, and goes on to state that only 7 lbs. of air per pound of coal really gets through the fuel bed. The Aeolipyle, it is claimed, will suppy the additional air needed. It is made of cast-iron and is furnished in all standard sizes, properly attached to a half section of pipe.

BUCKEYE MULITBLADE FAN, manufactured by the Buckeye Blower Co., Columbus, O., is the subject of a carefully-compiled bulletin (No. 101) giving the necessary engineering data for each type. The fans are described as especially useful where space is limited. Particular attention is called to the large unrestricted openings in comparison to the size of the wheel, thus permitting large volumes to be handled with modern velocities and minimum power consumption. The fans themselves are of rugged construction and special care has been taken to make them as noiseless as possible. The capacity tables are guaranteed by the manufacturers and any case not covered by these tables will be taken up on request by the company's engineering department. The data published cover both the overhung pulley and the direct-connected types, the latter being furnished for any available power and in any required size or type, with single or double inlet and single or double discharge. They can be had either blowing or exhausting. Size 8 x 10 3/4 in. Pp. 52.

W-C-K- CITY, being a remarkable composite view of work designed and constructed by the Westinghouse-Church-Kerr & Co., New York, is featured in a blanket circular issued by that company. The "W-C-K City," as shown, is a half-tone no less than 28 1/2 x 18 in. and the buildings shown embrace those for nineteen different industries, from an automobile plant, to a Staten Island country club. The "W-C-K City" cost $130,000,000.

BETSON ONE-PIECE PERMANENT BAFFLES for water-tube boilers are featured in newly-issued circular matter received from the Betson Plastic Fire Brick Co., Rome, N. Y. These baffles are made in one piece, without joints. No special tools, it is stated, are required nor are forms necessary, the requirements being confined to a few slats, a rod and Betson's plastic fire brick. The baffles made in this manner are described as permanent and gas-tight. The fact that this material will take up expansion and contraction internally is the explanation of its availability for baffle work.

Annual Dinner of Carrier Engineering Corporation.

Following a two-day convention of its organization, the Carrier Engineering Corporation, of New York, held its fourth annual dinner February 3, at the Hotel McAlpin, New York. Covers were laid for over 100 members of the organization. Among those at the guests' table, in addition to President W. H. Carrier and General Manager J. I. Lyle, were the toastmaster, Vice-President E. T. Murphy, Judge Julius M. Mayer, who sent the Soviet Ark to Europe. Warren Webster, Kenneth Moller, of Lockwood, Greene & Co.; Champlain L. Riley, of Clark, MacMullen & Riley; and A. S. Armagnac, editor of THE HEATING AND VENTILATING MAGAZINE.

In welcoming the diners, Mr. Murphy referred to the opportunity it gave them of seeing what was underneath the business end of the game. This he characterized as the spirit of loyalty and co-operation which formed the firm's ideal. It was hard to realize, he said, that only 4½ years had elapsed since the establishment of the corporation.

He then called upon E. T. Lyle, manager of the company's Boston branch, who dwelt upon the value of sales conventions in promoting a closer acquaintance on the part of the company's representatives.

The next speaker, A. E. Stacey, sprang a surprise upon J. I. Lyle by presenting him, on behalf of his associates, with a mechanical toy rooster, which proved to be a take-off on the general manager's propensities in the poultry line.

Kenneth Moller, of Lockwood, Greene & Co., told of the ways in which problems of mutual interest to the two companies could be worked out and urged close co-operation in such problems. He said the modern conception of cotton mill work is to plan the machinery and to erect the building around it.

Judge Julius M. Mayer, who was the main speaker of the evening, delivered a strong address on radicalism and ways to handle the conditions of industrial unrest.

Other speakers were Warren Webster, P. A. Hagen, R. W. Pryor, Jr., and A. S. Armagnac, who urged the younger men present to set a high mark for themselves as from their ranks would come the future leaders of the profession.

"Boston Tech" Co-Operates with Industry.

The plan of the Massachusetts Institute of Technology for selling its services to industry in definite contract form is attracting considerable attention in the business world. The "Technology Plan," as it is called, was evolved in connection with the institute's $8,000,000 endowment fund campaign, and to date has netted $767,700 in contracts sold to industrial concerns. Among the forty odd corporations which have signed the "Tech" contract are E. B. Badger & Sons Co., and the Stone & Webster Affiliated Companies. The plan, in substance, is that industrial organizations shall retain, consult, and work with the Massachusetts Institute of Technology under a contract which will bring them into the closest association with the institute. That is, in the future the institute is to be a

technical consulting bureau, as well as a technical school. By this arrangement a scientific library, said to be unsurpassed, will be available, with experienced men to guide the reader in finding the information sought. In addition, special apparatus and machinery, with assistants familiar with its operation and use, may be used in the technical development of new ideas. A classified list of graduates and former students, with their experience and major qualifications, will be open to those seeking the solution of special problems or the way out of a difficult technical situation. A knowledge of the particular facilities of commercial laboratories and engineering offices throughout the country will be accumulated and placed at the disposition of the corporations in usable form.

It is considered among the possibilities that ultimately the institute will be retained by many of the larger corporations, thus making it a great consulting body giving the institute the status of a clearing house of scientific knowledge.

Scope of "Mechanical Engineering" Enlarged.

An important side light on the trend of engineering society activities is to be seen in the plans of the American Society of Mechanical Engineers to enlarge the scope of the society's journal, *Mechanical Engineering*, to include the publication of papers and articles that have not been presented at any meeting of the society. It has also been decided to include in the journal news items of engineering interest, and information of general interest now presented in bulletin form. The subscription price has been advanced to $3.00 a year for members and $4.00 to non-members.

Presentation of Perkin Medal to Professor Charles Frederick Chandler.

The presentation of the Perkin medal to Professor Charles Frederick Chandler, which took place January 16, at the annual meeting of the Society of Chemical Industry, recalls the fact that Dr. Chandler was for 33 years dean of the School of Mines of Columbia University which he helped to found in 1864. There were at that time but few technical schools in the country. From that small beginning has grown the whole group of great technical schools at Columbia, including those of mines, engineering, chemistry, architecture and pure science, with many thousands of students in six splendid buildings and with a reputation that is international.

Dr. Chandler's greatest activities have been in connection with the development of chemistry. In the early days he lectured upon all branches of chemistry, both theoretical and applied. During the later years his lectures were mainly upon general and industrial chemistry.

Among the more important accomplishments of Dr. Chandler, outside of his college work, was the investigation of kerosene oil to make it safer for common use. As a result of his investigations an ordinance was adopted in New York limiting the sale of oil having a flash point below 100° or a burning point below 110°. Before long kerosene accidents, which had been alarmingly frequent, became comparatively rare. He has done some notable work for the Department of Health of New York City in connection with the city's water supply. He also conducted important investigations of the Hudson River and Saratoga waters.

Opportunities for Disabled Soldiers in Heating Work.

In response to an inquiry as to what proportion of disabled soldiers and sailors were actually taking training in work connected with the heating industry, word has been received from Uel W. Lamkin, chief of the Division of Rehabilitation, that many of the disabled men are taking courses in general engineering and in steam engineering. Many, also are taking courses in mechanics to become steam fitters.

"We have no courses," he adds, "listed specifically under heating and ventilation. We believe that heating and ventilation offer good opportunities for employment, and training in these fields will be given as occasion arises."

Report of Engineering Foundation.

A progress report of the Engineering Foundation, made to the United Engineering Society, has been published. It makes an interesting record of the formation and development of this organization, which owes its existence to the generosity of Ambrose Swasey, a former president of the American Society of Mechanical Engineers. To Mr. Swasey's initial gift of $200,000 to the foundation has recently been added another $100,000.

The report points out that it is a department of the United Engineering Societies and is not to be considered as a separate independent organization. The United Engineering Society, in turn, is a body created by the founder societies, comprising a membership of 40,000 engineers.

After giving an account of the career of Mr. Swasey and of the institution of the foundation, the report goes on to state specifically its method of operation, which is done largely in connection with the National Research Council. The work already accomplished relates to research in fatigue phenomena of metals, the preparation of a scheme for developing engineering and industrial research a report of which will be published shortly, and other investigations, including weirs for the measurement of water.

Deaths.

M. E. Danforth, Washington representative of the United States Radiator Corporation, died in Washington after a long period of failing health. Mr. Danforth had a host of friends in the trade and was for many years active in the Eastern Trade Golf Association.

Theodore Kruse, senior member of Kruse Co., Indianapolis, Ind., died in Indianapolis.

Samuel O. Dugger, of the California Hydraulic Engineering & Supply Co., San Francisco, Cal., died February 1 at his home in that city. He had just returned to his former home in Chicago and his death came as a shock to his many friends who had seen him so shortly before in the best of health. Mr. Dugger had been connected with the heating trade since 1894 when he represented the Standard Radiator Co., of Buffalo, in Chicago. Later he joined the organization of the Kewanee Tube Company. He subsequently organized the firm of Murphy-Dugger-Clark Co., jobbers of heating and plumbing supplies. Mr. Dugger's brother, J. P. Dugger, is secretary of the Kewanee Boiler Company.

Albert S. Hills, for twenty years treasurer of the Haydenville Co., Haydenville, Mass., died at the home of his brother, C. J. Hills, in that city, January 17. He was 60 years old.

Richard C. MacLaurin, president of the Massachusetts Institute of Technology, died of pneumonia, January 15, at his home in Cambridge. He was 49 years old, and had gained an international reputation as an educator, physicist, mathematician and jurist. Dr. MacLaurin lived to see the fulfillment of the plans for the greater Institute now housed in the remarkable buildings on the Charles River. He died just as the drive for the endowment of the Institute had been brought to a successful conclusion.

H. M. Davis, manager of the advertising department of the Sprague Electric Works of the General Electric Co., New York, died February 9, at his home in Brooklyn, after a lingering illness. He was nearly 60 years old. To Mr. Davis is given much of the credit for the development of advertising copy and designs which has led to the formation in many publishing plants of what is now known as the "Service Department." For four years he was advertising manager of a trade paper in New York and afterward became connected with an advertising agency, leaving in 1899 to take his position with the Sprague Electric Works. Mr. Davis was at one time president of the Brooklyn Christian Endeavor Union, numbering 6,000 members. He was chairman of the printing committee in connection with the Christian Endeavor convention held in Madison Square Garden, with an attendance of 60,000. A widow and daughter survive him.

CORTO

The Radiator Classic

Designed by Louis Courtot, Paris

This new French design occupies thirty percent less space. It has larger heat radiating power for its size, responds quicker, and weighs twenty-five percent less. Use the CORTO for your work in which quality, high efficiency, and artistic appearance are desired.

Attractive Corto booklet upon request

AMERICAN RADIATOR COMPANY

Sales branches and showrooms in all large cities

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

VAPOR HEATING.

The Dunham System.

In the Dunham system, as developed by the C. A. Dunham Co., Chicago, Ill., the piping is arranged as shown in Fig. 1. This is a closed return system, with each radiator having a trap which prevents the steam entering the return line.

The steam passes from the boiler B into the steam main SM in the usual manner and up to the radiators, into which it flows through the Dunham packless inlet valve, (Fig. 2). This valve utilizes a series of diaphragms for allowing the free up-and-down movement of the spindle without steam leakage, and at the same time obviating the possibility of leakage without the use of packing or stuffing boxes. This valve is not made in the graduated type (although it is equipped with plate and indicator showing when valve is "On" and "Off") as the Dunham Company does not believe in

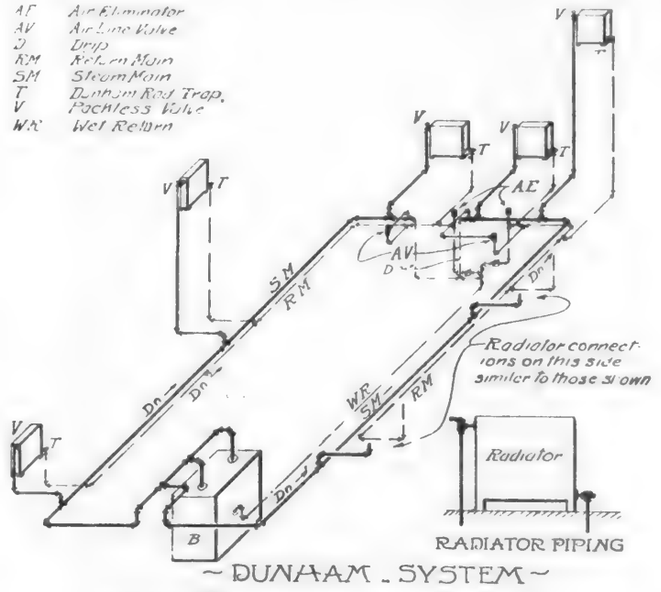


FIG. 1.—TYPICAL LAYOUT OF DUNHAM SYSTEM.

the possibility of graduating the supply of steam to radiators. The manufacturers state that they believe the amount of steam that will flow through a certain orifice is dependent upon the differential in pressure as between one side of that orifice and the other and that in a heating system this differential is beyond the control of the operator. It is next to impossible to maintain an absolutely constant pressure of steam upon the boiler, and it is quite impossible to regulate accurately the condensing powers of the radiator. Also that while some persons claim that they are able to positively regulate the pressure upon the boiler, no one claims to be able to establish a constancy in the outside weather conditions, the changing of which also changes the condensing capacity of the radiator. The construction of the Dunham valve permits it to be partially opened or closed at will, thus restricting the flow of steam to the radiator the same as for other valves of graduated type.

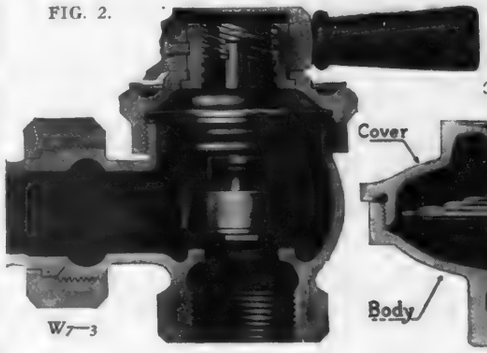
This valve can be used on any two-pipe steam heating system, either vapor, vacuum or pressure. It is made in the angle-pattern, lever-handled type only, and for that reason it is recommended only for radiators with top connection, although it will operate just as satisfactorily when connected to the bottom of radiators.

After passing through the radiator the air and condensation escape through the Dunham radiator trap (Fig. 3).

When the radiator has filled with steam and the steam surrounds the disc in the trap, the volatile fluids within the disc are heated and vaporized, thereby creating a pressure within the disc; this internal pressure expands the disc, the valve seats over

(*Continued on Data Sheet No.* 132-L.)

FIG. 2.



VAPOR HEATING.

The Dunham System.

Continued from Sheet No. 132-K.

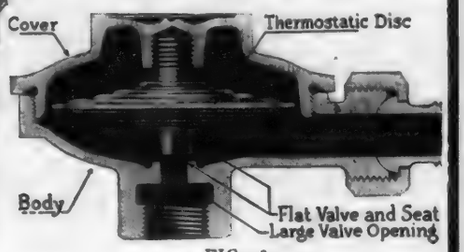
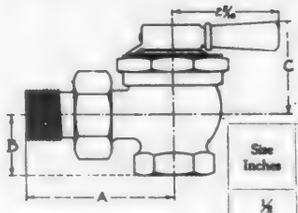
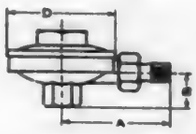


FIG. 3.



(For pressures not exceeding 10 pounds gauge.)

Size Inches	Dimensions A	B	C	Square Feet Radiation
¼	3	1 5/16	1 15/16	Up to 40
⅜	3 1/16	1 5/16	1 15/16	41 to 100
1	3 1/16	1 5/16	2 5/16	101 to 180
1¼	3 1/16	1 5/16	2 7/16	181 to 300



(For pressure not exceeding 10 lbs. gauge.)

Size	Tapping	Capacity Direct Radiation Sq. Ft.	Dimensions A	B	C	D	E
No. 2	½ in.	350	3¾	1¼	2⅝	3 15/16	½

the opening, and waste of steam is prevented. Subsequent water and air forming in the radiator fall to the bottom, surround the disc, condense the gases within it, and the disc contracts, raising the valve from its seat and allowing the air and water to pass out into the return line; steam following behind the air and water, causes disc to again close.

The Dunham radiator trap is for use on all two pipe steam systems, using steam from a minus pressure, as in the case of a vacuum system, up to 10 lbs, pressure above atmosphere; it can be applied on either steam or water type radiators. The use of water type radiators is recommended, however, as circulation through the radiator takes place more quickly and at a lower steam pressure.

The steam main pitches on down to the point when the last radiator connection is taken off. Here an air vent is located to relieve the air, the pipe being run to a Dunham air line valve which permits the air to escape into the return line, while the condensation flowing along the main is relieved by a drip at the end of the main which drops down under the water line and is connected to the wet return to the boiler.

The return main runs parallel with the steam main and pitches down in the same direction. At the end of the run a tee is placed and the condensation passes off through the bottom outlet of the tee and back into the boiler through a check valve. The level of the return main must be kept at least 24-in. above the boiler water line as far as the location of the above mentioned tee.

This is owing to the fact that from the top outlet of the tee a connection is made to a Dunham air eliminator valve which relieves all the air in the system by allowing it to escape into the atmosphere.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

VAPOR HEATING.

The McAlear System.

McAlear vapor and atmospheric appliances, manufactured by the McAlear Mfg. Co., Chicago, Ill., are separated into two distinct systems which are differentiated by this manufacturer as follows:

"A vapor system is one which generally operates within 2 lbs. of atmosphere and should be provided with some positive means to return condensation to the boiler at any pressure difference between the boiler and the returns."

"An atmospheric system is one which is operated at within a few ounces of atmosphere and depends for its successful performance on very sensitive damper regulation, since any rise in boiler pressure will prevent the return of the condensation."

The distinction, as above enumerated, practically boils down to this, that a vapor

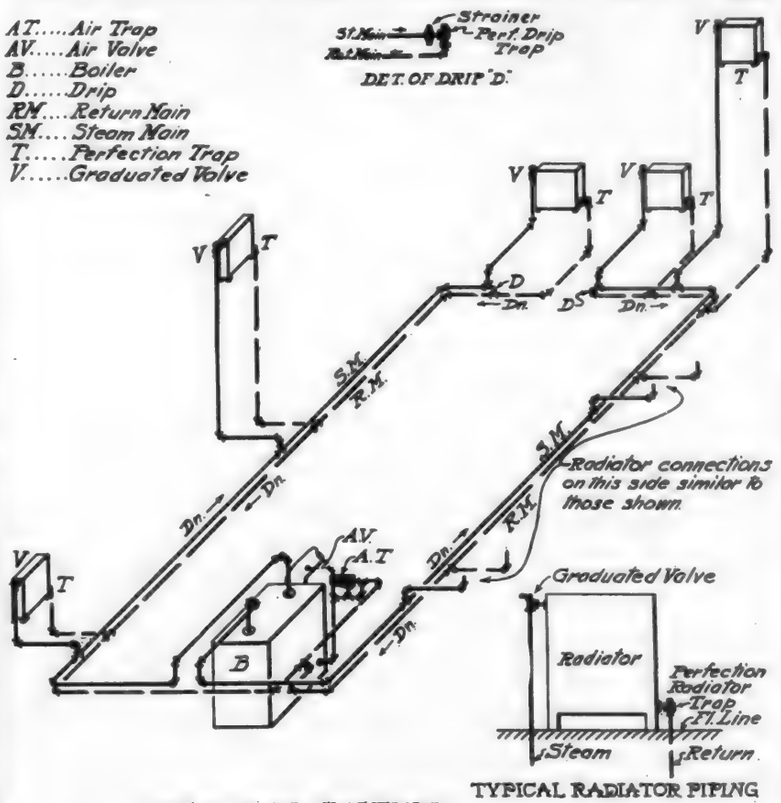


FIG. 1.

system is capable of carrying up to 2 lbs. gauge pressure (due to the automatic return trap being able to return the water to the boiler under this pressure) whereas the atmospheric system has no such return trap and, therefore, must operate at a lower pressure of only a few ounces.

The requirements consist of special modulation valves on the radiator supplies, special traps on the radiator returns, a special return trap or special air valve at the

(*Continued on Data Sheet No. 132-N.*)

VAPOR HEATING—THE McAlear System. No. 132-M

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

VAPOR HEATING.

The McAlear System.

(*Continued from Data Sheet No. 132-M.*)

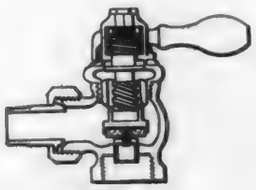


FIG. 2.

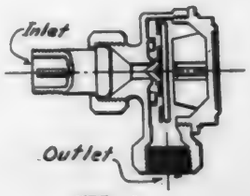


FIG. 3.

boiler and (with the atmospheric system) a special super-sensitive damper regulator.

The *vapor* system is illustrated in Fig. 1. The steam and return mains must be liberally sized so as to reduce the pressure drop to a minimum, while the return should be only one or two sizes smaller. The mains must be properly pitched and drained through traps to prevent steam blowing through into the return line. The return must be run without pockets and be pitched in the direction of flow in order to permit freedom of air removal.

The modulation valves are of the packless type (Fig. 2) and are made in sizes and carry the dimensions shown in Table I.

TABLE I.

	Inches.				
Size of valve	½	¾	1	1¼	1½
Face of outlet to center line of outlet	1¼	1 5/16	1½	1¾	2
Face of inlet to center line of outlet	2½	2⅝	3¼	3½	3⅞

These valves are made in angle pattern only and employ varying discs to suit the different sizes of radiators.

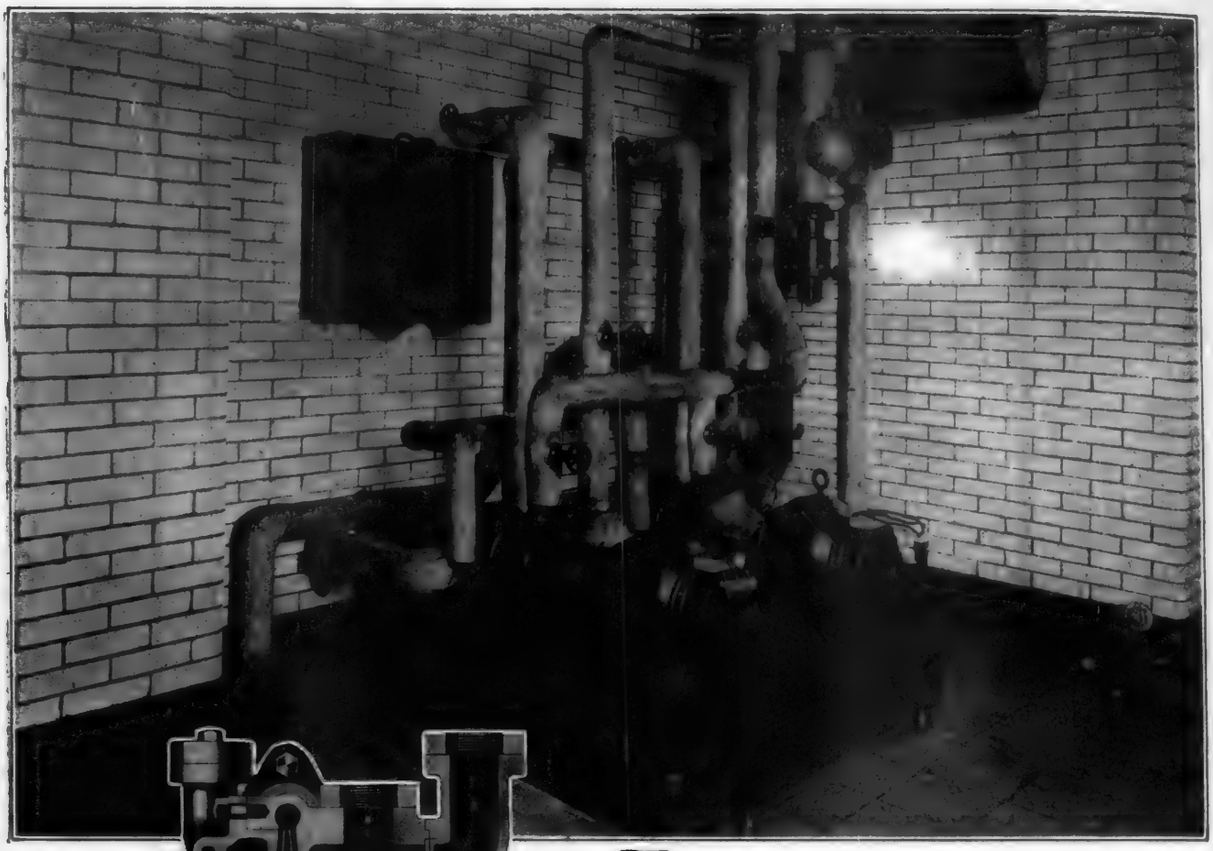
On the return end of each radiator is placed a Perfection radiator trap (Fig. 3). By swinging on the union the outlet may be pointed down or 45° forward or back. This obviates the necessity of using right and left-hand valves. These traps, known as No. 28, come in one size only ½-in., and are good for anything up to 300 sq. ft. of direct cast-iron radiation. For blast coils and other large amounts of surface, a larger trap is made. The dimensions of No. 28 are:

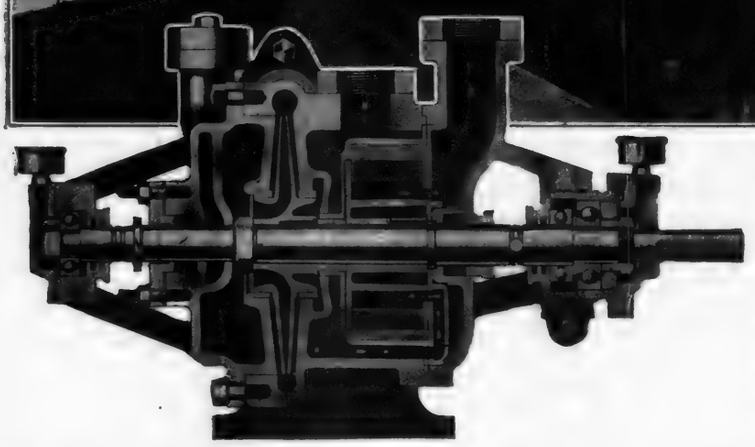
Face to center of inlet, 2 1/16 in.; face to center of outlet, 2½ in.; diameter of valve body, 2¾ in.

After passing through the radiator trap, the air and condensation follow down the return line and back to the boiler. Near the boiler the return line has connected in parallel an "air exhauster and return trap" (Fig. 4). It operates whenever the boiler pressure is sufficient to back up the return into its chamber. The principle of operation is the rising return which lifts the float and opens the steam inlet. This equalizes the pressure on both sides of the water so that the water falls into the boiler by gravity. After discharging, the air relief opens, relieves the steam pressure, the returns again flow into the trap and the process is repeated.

(*Concluded on Data Sheet No. 132-O.*)

EFFICIENT HEATING
demands the Jennings Pump





Duplex "C" Unit, Automatic Operation

AMERICAN EXPRESS BUILDING
65 Broadway
New York City

Combined capacity 52,000 sq. ft. direct radiation. Each pump has an air capacity of nineteen cubic feet per minute in addition to a water capacity of thirty-five gallons per minute.

Installed November, 1916.

The motors are only two horse power.

THE Jennings Pump consists of two independent turbine units, an air pump and a water pump As each material is handled separately, the boiler pressure is against the water only. The air and vapor, approximately, four-fifths of the volume handled, are delivered to atmosphere without back pressure. The saving in horse power is over fifty per cent.

Because of its compact design, this equipment can be installed in less than one-third the space necessary with other apparatus. All interior parts are bronze, supported on annular ball bearings mounted outside of casing. Moving parts revolve without contact.

There are many other reasons why the Jennings is being installed on practically all of the big jobs. Bulletin No. 8 gives them in detail. Write for it.

NASH ENGINEERING COMPANY
SO. NORWALK, CONN., U. S. A.

TRADE AND MISCELLANEOUS NOTES

Coming Events.

May 24-27, 1920.—Thirty-first annual convention of the Heating and Piping Contractors' National Association, in Cleveland, O. Headquarters at the Hotel Cleveland.

May 24-27, 1920.—Spring meeting of the American Society of Mechanical Engineers, in St. Louis, Mo.

Miscellaneous Notes.

Washington, D. C.—The federal census of manufactures is now under way and a large field force is engaged in collecting these statistics. A special feature of this census will be the presenting of the statistics of manufactures by industrial zones. In former years statistics of manufactures have been presented geograhically by States and by cities of 10,000 and over.

Home-owning, as stimulated by National Thrift Week, is declared to have been given a marked impetus in a number of different localities, according to a report issued from National Thrift Week headquarters. In Hamilton, O., for instance, where "Own Your Own Home" Day was observed, over $300,000 was deposited to the credit of either new or old accounts with building and loan associations.

American Society of Mechanical Engineers will hold its spring meeting in St. Louis, Mo., May 24-27. The program will include a paper on a large housing proposition that is under way in that city.

Massachusetts Institute of Technology has announced the identity of the "mysterious Mr. Smith," who, in the recent drive for a $4,000,000 endowment, offered $5.00 for every $3.00 that others contributed up to a limit of $2,500,000. At a recent jubilee dinner of the alumni of the institute, to celebrate the successful completion of the drive, the real name of this benefactor was disclosed as George Eastman, of the Eastman Kodak Co., Rochester, N. Y. It is stated that Mr. Eastmen's total gifts to the Massachusetts Institute of Technology total $11,000,000, all of which, with the exception of a quarter of a million specifically for chemically engineering equipment, was given anonymously.

New York.—Another period of "heatless" buildings was threatened in New York recently when the engineers, firemen, oilers and coal passers in office buildings, hotels, apartment houses and hospitals, presented new wage demands to their employers. The men were awarded a general raise, which averted the threatened strike.

Joint Council of Engineering Societies of San Francisco has adopted a resolution favoring Herbert C. Hoover for President of the United States. The council represents 2000 engineers in the Bay district. Engineering bodies of the United States are invited to join with the San Francisco body in forming an organization to further Mr. Hoover's candidacy.

National Trade Extension Bureau is featuring March as "Show Room Month." Where contractors are mov-

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45 FULTON STREET, NEW YORK

VENTILATING ENGINEERS AND CONTRACTORS

MANUFACTURERS OF

Blackman

AND

Duplex Cone Fans

COMPLETE WITH

Motors, Duct Work and Wiring

Aligning, Rigging, Hoisting

GET OUR PRICES, PROFIT BY OUR EXPERIENCE OF LONG STANDING.

SEND FOR CATALOGUE.

ing to new locations they are urged to add show rooms to their business quarters. Existing shops are urged to modernize their interiors this month and make plans for stimulating business during the summer "dull" season.

January Building Operations, according to F. W. Dodge Company's review of building activity, show that in the territory east of the Missouri and north of the Ohio Rivers, the contracts amounted to 10% more than the average monthly figure for 1919, while industrial plants took the lead over all other classes of building, comprising 39% of the total. Contracts let in January amounted to $235,848,000, whereas the average monthly figure for 1919 was $213,000,000. Ordinarily, other classes of building, comprising 39% of the total. Contracts let in January amounted to $235,848,000, whereas the average monthly figure for 1919 was $213,000,000. Ordinarily, the month of January shows but little activity in comparison with months later in the year, the amount of contracts let in that month running normally to only about 5% to 6% of the year's total. It is stated that with so large a figure for January, the previously-published estimate of $3,000,000,000 for the year's total of contracts seems very likely to be fulfilled. Projected or contemplated work amounting to $523,000,000 was reported in January, as against a monthly average of $360,000,000 for projected work reported in 1919. New York and Northern New Jersey made an unprecedented showing, the contract awards in January amounting to $79,570,000, which is greatly in excess of the average monthly figure for 1919. The Northwest and the Pittsburgh districts also made fine showings.

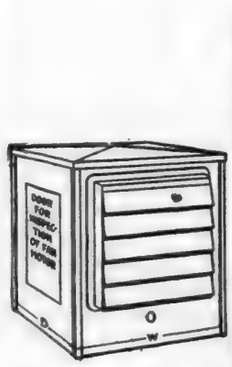
Julien Champtaux, a well-known French heating and ventilating engineer, send greetings from Lille, France, where he is located as Minister of Liberated Regions. His address is 21 Rue Leon-Gambetta.

Potomac Manufacturing Co., Philadelphia, Pa., was represented at the recent annual meeting of the heating

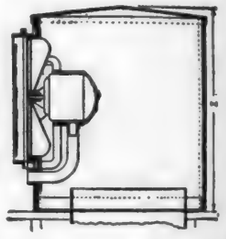
ILG POWER ROOF VENTILATORS

FOR

Buildings where Roof Ventilation Provides the only Practical Means of Exhausting Foul Air, Steam, Smoke, etc.



Ilg Power Roof Ventilator Showing Automatic Shutter



Sectional View Showing Placement of Fan

Fig 1. Showing localizing method of installing Ilg Power Roof Ventilator with vertical duct connected to hood over furnaces, mixing or cooking vats.

Fig 2. Lodge halls, theatres and upper floors of stores, factories, etc., are effectively ventilated by drawing air out through false space between ceiling and roof. Note registers in ceiling.

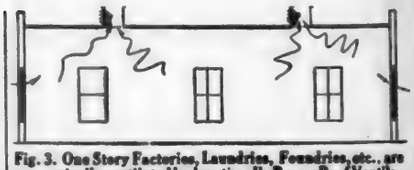


Fig. 3. One Story Factories, Laundries, Foundries, etc., are economically ventilated by locating Ilg Power Roof Ventilators directly over spots where ventilation is most needed. Fresh air thru windows gives complete circulation.

In sound practice, irrespective of atmospheric conditions, one ILG POWER ROOF VENTILATOR is equal to several ordinary natural gravity ventilators. Where the air to be handled is heavily ladened with steam, moisture, smoke, gases or fumes, the ILG POWER ROOF VENTILATOR is by far the most efficient. The only equipment of the kind with a "Fully enclosed self-cooled motor" driven fan.

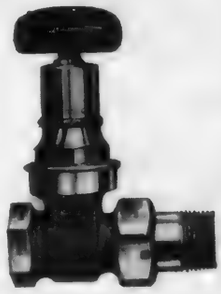
WRITE FOR CIRCULAR ILLUSTRATING THIS APPARATUS IN DETAIL

ILG ELECTRIC VENTILATING CO.

158 Whiting Street CHICAGO, ILL.

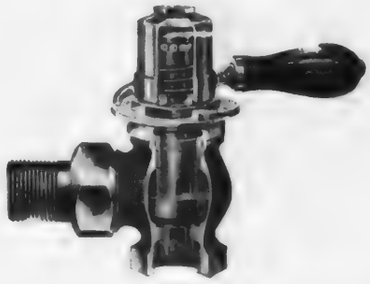
BRANCHES IN ALL LARGE CITIES

DOLE
PACKLESS
RADIATOR
VALVES



Insure Satisfaction

A Valve for Every System



Write for Catalogue and Discounts

The Dole Valve Company

208 North Fifth Ave. CHICAGO

"It only takes a minute or so to renew a Jenkins disc"—

and at all times you have a perfect contact on the valve seat. Jenkins composition discs are made of ingredients which long experience has taught us to be most serviceable, and are compounded with care and accuracy.

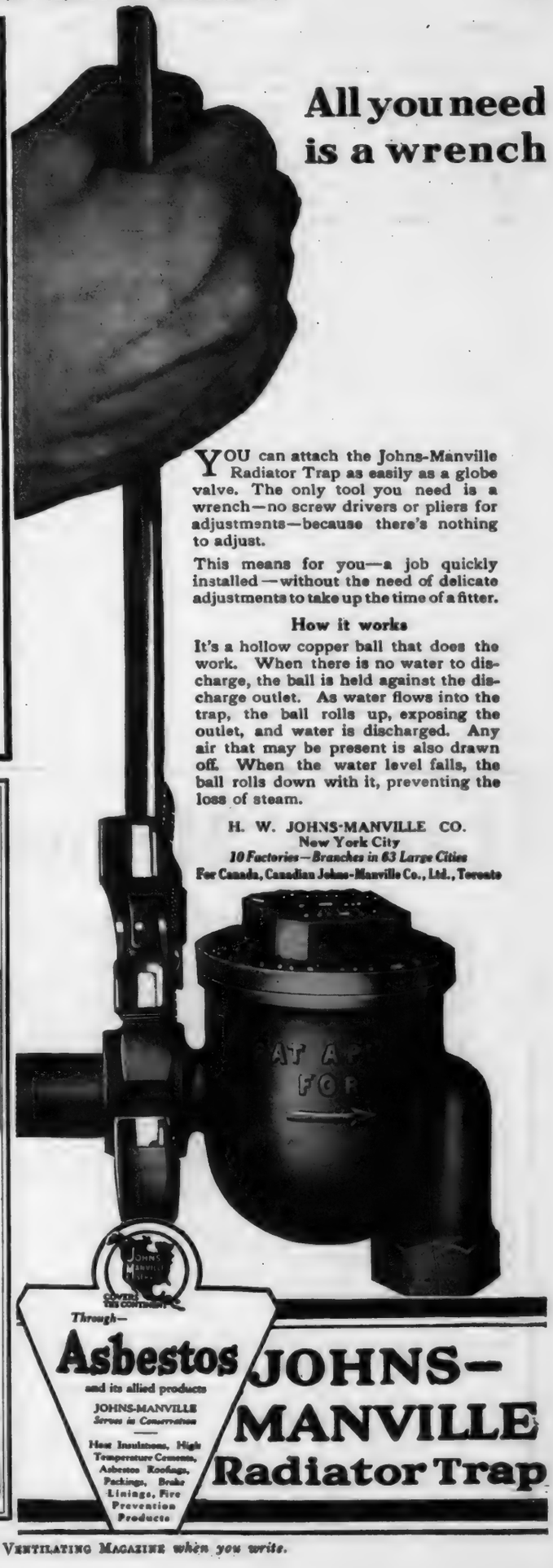
Maximum service comes from the right combination, namely, genuine Jenkins discs in genuine Jenkins Valves—know them both by the Jenkins "Diamond Mark."

JENKINS BROS.

New York Philadelphia Boston Chicago Montreal London

Jenkins Valves

2071-J



All you need is a wrench

YOU can attach the Johns-Manville Radiator Trap as easily as a globe valve. The only tool you need is a wrench—no screw drivers or pliers for adjustments—because there's nothing to adjust.

This means for you—a job quickly installed—without the need of delicate adjustments to take up the time of a fitter.

How it works

It's a hollow copper ball that does the work. When there is no water to discharge, the ball is held against the discharge outlet. As water flows into the trap, the ball rolls up, exposing the outlet, and water is discharged. Any air that may be present is also drawn off. When the water level falls, the ball rolls down with it, preventing the loss of steam.

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities
For Canada, Canadian Johns-Manville Co., Ltd., Toronto

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Asbestos and its allied products

JOHNS-MANVILLE
Serves in Conservation

Heat Insulations, High Temperature Cements, Asbestos Roofings, Packings, Brake Linings, Fire Prevention Products

JOHNS-MANVILLE Radiator Trap

engineers' society by Mrs. A. W. Harmon, who is not only the owner of the business which embraces various forms of metal working, but is also the only woman member of the National Sheet Metal Contractors' Association. Mrs. Harmon was a guest at the annual dinner of the society where her unique position gave her unusual prominence.

M. A. Dame & Son Co., Lynn, Mass. with offices also in Boston, Norfolk, Va., and Washington, contracting engineers for power plants, heating, ventilating, plumbing, etc., announces the removal of its Boston offices, to Suite 435-436 Little Building, Tremont and Boylston Streets.

Cleveland, O.—Heating and Piping Contractors' Association of Cleveland, at its recent annual meeting in that city, voted to join the Cleveland Building Trades Employers' Association. The new officers of the Heating and Piping Contractors' Association are: President, W. B. Van Sickle; vice-president, Walter Klie; secretary, M. L. Crowell; Treasurer, F. M. Daugherty. Executive committee: The officers and W. C. Clark, A. E. Welker, Edward Maurer, Charles H. Mallett, A. W. Growe, Richard Morgan and Adolph Weiss.

Dorsey W. Hyde, Jr., has resigned as librarian of the New York Municipal Reference Library to accept a position as chief of the motor truck research bureau of the Packard Motor Co., Detroit. He has been succeeded at the Municipal Reference Library by Miss Rebecca B. Rankin, who has served as assistant librarian during the past year.

Industrial Safety Codes to the number of 50 or over will be prepared during the next few years by the American Engineering Standards Committee, as the result of a recent conference on the part of those interested, held at the Bureau of Standards, in Washington. In accordance with the recommendation of the conference the American Engineering Standards Committee requested the International Association of Industrial Accidents Board and Commissions, the Bureau of Standards, and the Natioanl Safety Council to organize a Joint Committee on Safety Codes. The committee held its first meeting in Washington January 9, at which time tentative recommendations were formulated for some thirty safety codes. An announcement issued by the American Engineering Standards Committee states that Professor Comfort A. Adams has resigned as chairman, his place being taken by A. A. Stevenson, a former president of the American Society of Testing Materials. Dr. P. G. Agnew, formerly of the United States Bureau of Standards, is now secretary, with headquarters in the Engineering Societies Building, New York. Work already accomplished by the American Engineering Standards Committee includes approval of the specifications for standard pipe threads for which the A. S. M. E. and American Gas Associations are sponsors, and the committee is representing America on this subject at the Paris international conference. Co-operation is in progress with the National Screw Thread Commission, engaged in efforts to standardize screw threads.

Associated General Contractors of America and Affiliated Organizations held their annual meeting in Chicago, February 18-19, when a two-day national conference on construction problems was held. The nominations for officers for the ensuing year included the name of John W. Cowper, president of the John W. Cowper Co., Buffalo, N. Y. for second vice-president. The new president of the association is W. A. Rogers, president of the Bates & Rogers Construction Co., Chicago. Among the subjects discussed were "The Lump Sum and the Cost-Plus Forms of Contract," "The Expense of Estimating," "The National Board of Jurisdictional Awards," and "The Joint Conference Plan with Labor." The associations's headquarters are at 111 West Washington St., Chicago, G. W. Buckholz, secretary.

Buffalo, N. Y.—Buffalo is about to spend $13,000,000 for sixteen new schools and additions to two schools.

Utica, N. Y.—The Board of Educa-

Lehigh Mushroom Ventilators

Saving in Cost
Economy in Installation
Ease in Adjustments
Efficiency in Operation

HERSH & BROTHER

MANUFACTURERS OF
FANS, AIR WASHERS AND VENTILATING EQUIPMENT
ALLENTOWN, PA.

DATA BOOK: Write for your copy of our new data book on fan engineering

"Sirocco"
TRADE MARK

Interior View of Sirocco Equipment of Buick Motor Co., Flint, Mich.

Conditioned Air in the Automotive Industry

Manufacturers of automobiles and automobile accessories are considered among the leaders in the application of heating and ventilating and air conditioning in their plants.

The installations they have made have been based upon careful study of the conditions as applied to the employe as well as the general manufacturer. They have found that in order to keep production up to the necessary standard, workers must be supplied with clear, pure air.

The view above illustrates "Sirocco" Air Conditioning equipment installed at the Buick Motor Car Company at Flint, Michigan. With this method the air is washed of all impurities and sent out into the factory heated to the proper degree for comfort in the winter and cooled to the right temperature during the summer months.

Air conditioning equipment is only a part of a number of heating and ventilating products bearing the "Sirocco" mark. If you have a problem that involves ventilating or air conditioning especially, we would like to have you get in touch with us.

AMERICAN BLOWER COMPANY, Detroit, Michigan

Branches in all large cities

Canadian Sirocco Company, Ltd.
Windsor, Ont.

tion is divided over the use of mechanical and unit ventilating systems in the projected school buildings. A series of inspections of buildings equipped with each type of system has been decided upon to settle the matter.

Sioux Falls, S. D.—A repair bureau of the building inspector's department is being advocated in Sioux Falls by Mayor Broening as the best way to deal with the breakdowns in heating plants, leaky roofs and other urgent repairs to schools and other public buildings. Incidentally, a movement has been started to secure greater uniformity in the heating apparatus used, so that repairs will involve less expense and may be made more readily.

Olean, N. Y.—A new heating and ventilating system will be installed in the high school building in Olean, due to the order of the public service commission cutting off from the gas supply all furnaces which had been designed originally to burn coal. An attempt was made to burn soft coal in the high school boilers, but this has not been satisfactory.

Minnesota Sanitary and Heating Engineers is the new title of the Minnesota Association of Master Plumbers, adopted at its recent meeting in Minneapolis. Among the speakers at the convention was William J. Woolley, manager of the National Trade Extension Bureau, who said that because jobbers throughout the country have feared further delay in delivery by manufacturers and have placed orders for their total requirements with each of several sources in the hope of obtaining delivery from at least one source in good time, American industry now faces the serious problem of wholesale cancellation of orders.

Rock Island, Ill.—A new system of ventilating street cars is to be used by the Tri-City Railway Company. Vents in the roof section of the cars are to be supplied with horizontal strips of metal which will admit air indirectly to the car and take it out in the same manner.

Cedar Rapids, Ia.—The city order to keep one or more ventilators open in each street car at all times as a precaution against the spread of disease, has been rescinded on the ground that such action imposes a hardship on the car crews who must stand for hours without exercise close to constantly opening doors, admitting cold air into the already chilled car interior.

St. Louis, Mo.—A proposed city ordinance has been drawn up by the Public Welfare Committee of the Tenth Ward Improvement Association and presented to the city council, requiring the proper heating of apartment houses.

Harold A. Petterson, Am. Soc. C. E., professor of hydraulic and sanitary engineering in Pei Yang University, Tientsin, China, desires to receive radiator catalogues and price lists from manufacturers on the Atlantic Coast. The Atlantic Coast is specified because of the advantage in freight rates for shipment to China via the Panama Canal. Catalogues and price-lists are also desired on warm-air furnaces, radiator paints, and cements for boilers and furnaces.

Central Station Heating Notes.

BALTIMORE, MD.—A typical instance of what happens when a central heating plant of inadequate capacity is installed is shown in the action of the residents of the Carlin development on Reigerstown Road, Baltimore, in entering a complaint against the Carlin Heating Company for failure to heat homes under contract for community heat. It appeared that the plant was designed for serving 125 homes and that this number has since increased to 167 homes. All the houses, except a few built first in the development, were constructed without chimneys and depend almost entirely on the community steam heat. Mr. Carlin testified that he has been operating the present plant at a loss of from $3,000 to $5,000 a year and that it is impossible for him to continue the service at the

This New Improved CYCLOIDAL Multivane Wheel

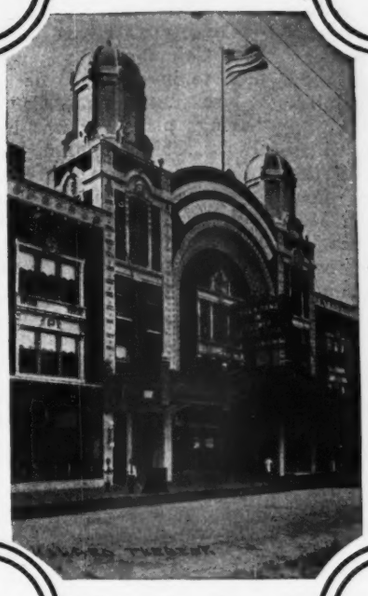
was designed for heating and ventilating requirements where the ordinary wheel was not sufficient. You will note that the vanes in this wheel curve forward and are set at an angle to the shaft. This, a patented feature, allows a uniform, unrestricted flow of air across the entire width of the wheel. Highest effiiciency of operation, noiselessness and durability are guaranteed CYCLOIDAL features.

Write for further details.

Garden City Fan Co.
Est. 1879
CHICAGO, ILL.
Eastern Representatives:
L. J. WING MFG. CO., New York

THE MARK OF HIGH EFFICIENCY
Cycloidal

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*



Meeting Theater Needs with Massachusetts Fans

There is something more than first cost, something more than efficiency, something more than operating expense, that makes Massachusetts Squirrel Cage Fans the choice of engineers for theatre ventilation.

That something more is

SILENCE

So well proportioned are these fans that the sound of rushing air through inlet and outlet is reduced to a minimum.

So rigidly constructed that the noises of material vibration are unheard a few feet from the fan.

In the Howard Theatre Bldg., Chicago, Ill., two Massachusetts Fans and Massachusetts Air Washers furnish clean, pure air without noise or vibration and at low cost.

MASSACHUSETTS BLOWER CO.

Watertown, Mass.

New York Boston Chicago

Branches in 20 principal cities throughout the country 100-10

MASSACHUSETTS FANS

same rate. With an increased rate, he said, he would be justified in enlarging his plant and would then be able to furnish sufficient heat.

SPRINGFIELD, ILL.—Five applications to increase the present rates for steam heat have been filed with the State utilities commission. They are from Danville, Galesburg, Clinton, Urbana and Normal. The new rates proposed by the companies would be effective March 31, 1920.

DECATUR, ILL.—The Decatur Railway & Light Company has made application to the State public utilities commission to increase its rates for steam heat, to become effective March 31, 1920. The increase, if granted, would not apply to the first 2000 lbs. of condensation used, but would mean a considerable advance on all above 2000 lbs. Under the present rate the charge for the first 2000 lbs. per month is $1.67 per 1000 lbs. The present rate on all over 2000 lbs. is 56 cents per 1000 lbs.

Manufacturers' Notes.

NIAGARA BOILER & RADITOR Co., North Tonawanda, N. Y., has acquired the plant of the J. H. McLain Co., Canton, O., manufacturer of boilers, etc. The Canton plant will be operated as a branch of the Niagara Boiler & Radiator Company. The McLain company's plant has been operated by Weil Bros., Chicago, and it was proposed to remove the plant to Batavia, but this plan was later abandoned.

NASON MFG. CO., New York, has purchased the building occupied by the company for many years, extending from 71 Fulton Street to 71 Beekman Street. The company conducts a jobbing business in heating and plumbing goods.

UNITED STATES RADIATOR CORPORATION, Detroit, Mich., has declared a dividend of 7% on the preferred stock of the corporation.

KEWANEE BOILER CO., Kewanee, Ill., has purchased ten acres of land west of its old plant in Kewanee and has awarded contracts for the construction of buildings to cover about 3 1/3 acres to accommodate additions to its boiler plant and foundry. Most of the buildings will be 80 x 1750 ft., of steel and glass construction. This gives a total area for the company's plant of 30 acres. The company has also acquired a site in Chicago, 100 ft. x 100 ft., at Washington and Green Streets, on which will be built a four-story office building. The company's Chicago office will be moved to this building as soon as it is completed. At the annual meeting of the company, January 27, the action of the stockholders was confirmed in reference to the issue of $1,000,000 in serial bonds. The bonds will be sold through the Kewanee Securities Company. At the meeting the officers were re-elected as follows: President, E. E. Baker; vice-president, B. F. Baker; secretary, J. P. Dugger; treasurer, B. F. Baker; manager, M. F. Moore. H. E. Pursell was reappointed sales manager.

BURNHAM BOILER CORPORATION, Irvington, N. Y., has been organized to continue the boiler department of the Lord & Burnham Co. The new company will retain the present executive, engineering and production staff and will operate plants at Irvington and Elizabeth, N. J.

KELLOGG-MACKAY Co., Chicago, Ill., held the annual convention of its selling force in Chicago, January 22-23. It was announced that a 10-year lease, involving a total rental of $52,000 was taken by the company in the A. Hirschman Building, 142-146 West Third Street, St. Paul, Minn., which will be occupied as a branch house to take care of the trade in the Northwest. The new branch will be in charge of J. D. McGuire, who is well known in the heating and plumbing supply trade, having been recently connected with the Monument Plumbing Supply Co., St. Louis.

INTERNATIONAL HEATER Co., Utica, N. Y., is planning to build an extension to its plant in Utica, having recently purchased a large plot of land for this purpose.

D. & T. MFG. Co., St. Louis, Mo., manufacturer of heating systems, has moved to new quarters at 3000 La Salle St., St. Louis, where larger facilities are available for taking care of the company's increased business.

UNION RADIATOR Co., Johnstown, Pa., has moved its warehouse in Chicago to Cerry Avenue and Bliss Street. The company's Chicago office remains at 1507 Lytton Building, Charles O. Lindahl being in charge.

VAPOR HEATING Co., York, Pa., has elected Charles E. Scott vice-president of the company. Mr. Scott is manager of the company's New York office where he will continue to have his headquarters. C. H. Strayer has been appointed sales manager, with headquarters at York. Recent additions to the company's engineering department include Paul E. Somers and Henry Somers.

MCDONALD UNDER-SEAT VALVE Co., Cleveland, O., has increased its capital stock to $500,000. The officers of the company are: President, S. F. McDonald; secretary and treasurer, John L. Dowling.

ABENDROTH BROS., Port Chester, N. Y., announces the establishment of a Boston office at 1106 Old South Building. The office will be in charge of J. C. McAllister, the company's Boston representative. A comprehensive stock of Mallory-Abendroth boilers will be carried in Boston.

TRANE Co., LaCrosse, Wis., manufacturers of the Trane system of vapor heating, is now represented in Philadelphia by Charles Speckman, 20 South Seventh St., Philadelphia.

CRANE Co., Chicago, Ill., has re-elected the following officers: President, R. T. Crane, Jr.; first vice-president, J. B. Berryman; Vice-presidents, A. D. MacGill (in charge of finance), C. A. G. Wayman (in charge of manufacturing), E. H. Raymond (in charge of sales); secretary, H. P. Bishop; treasurer, A. D. MacGill; C. D. Little was appointed general manager of sales; R. B. Stiles, manager of branches; William J. Clark, architect and engineer.

PETROLEUM HEAT & POWER Co., New York, has purchased a large tract of land on the water front in Stamford, Conn., on which a fuel-oil storage plant will be erected. The company was formerly the Fess Rotary Oil Burner, Inc., of Boston.

COLUMBUS HEATING & VENTILATING Co., Columbus, O., is planning an addition to its plant, to occupy 100 x 120 ft.

KROESCHELL BROS. Co., Chicago, Ill., is having plans drawn by Davidson & Weiss, Chicago, for manufacturing plant, to be erected on the west side. It will comprise several 2 1/2-story buildings, including a factory, machine shop, office building and boiler house, of brick, steel and concrete. The estimated cost is $450,000.

READING VALVE & FITTINGS Co., Reading, Pa., has increased its capital stock from $200,000 to $300,000.

New Incorporations.

NATIONAL INSULATING Co., Parkersburg, W. Va., capital $40,000, to manufacture insulating equipment. Incorporators: J. Marshall, C. D. Forrer and M. E. Heihle.

MASON-HANSON Co., New London, Conn., capital $25,000 to deal in heating, plumbing and mill supplies. Incorporators: T. N. Hansen, West Hartford, Conn., and T. E. Troland, New London, Conn.

A. P. HARDER FURNACE Co., Rockford, Ill., capital $300,000, to manufacture smoke-consuming warm air furnaces. Incorporators: A. P. Harder, Charles Andrews, Jr., and G. A. Brodine. The trade name of "Smoke-Burn" has been adopted for the company's product. It is described as a patented heater built on a new plan and is said to utilize almost all the heat units in the coal. A limited number of them have been installed in Rockford homes. The company will shortly erect a new plant for increasing its production.

New Guarantee for Hoffman Valves

Based on a suggestion made by J. F. Musselman in an article on "The Part of Air Vents in Steam Heating Progress," which appeared in the *Architectural Review*, the Hoffman Specialty Co., New York, manufacturer of the Hoffman line of air valves and other steam heating specialties, has come out with a new form of guarantee for each lot of valves sold, giving the name of the contractor, the date of installation and the name of the building. The guarantee continues: "Should any of the Hoffman valves above specified show defects in manufacture or fail to operate in a satisfactory manner at any time within five years from date of installation, new valves or new parts will be supplied without charge, to replace such valves or parts." At one side of the

RELIABILITY

Where reliability starts worry stops. One of the chief functions we perform for engineers and contractors is to eliminate worry over what should have been done by the manufacturer before installation work starts.

Sturtevant
(REG·U·S·PAT·OFF·)

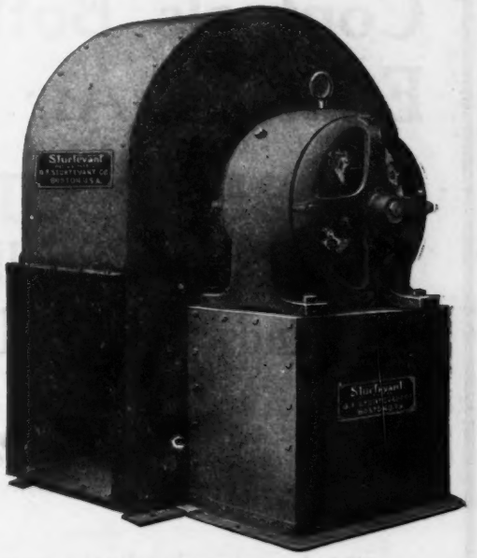
HEATING AND VENTILATING SYSTEMS

are made to fit the job for which they are intended. One factory builds the complete apparatus from the sheet steel used in the fan to the motor which drives the fan. Every operation is executed with care, and the apparatus is erected and tested in our shop before it goes onto the freight cars.

You receive it just as you should receive it, and your work is carried through without delays which are often caused by having to do little details the manufacturer should have done.

Sturtevant Apparatus

enables you to do your work promptly and finally. When you leave the job, you have the assurance that it will not need any more of your time. These facts deserve your consideration because they mean dollars saved. Consult our nearest office; there are twenty-four in the United States and Canada.



Typical Sturtevant Heating and Ventilating Fan with Sturtevant Motor

B. F. STURTEVANT COMPANY
HYDE PARK, BOSTON, MASSACHUSETTS

AND ALL PRINCIPAL CITIES

form are the words: "We certify that valves above specified are in accordance with our plans and specifications." This is to be signed by the architect or heating engineer.

The company's new form of guarantee as well as Mr. Musselman's article are given in two publications of uniform size reprinted by the Hoffman Specialty Company. In parallel columns with Mr. Musselman's article, which takes up the present defects of most present and former valves, are given paragraphs showing just how and why Hoffman valves avoid each defect he condemns and possess each quality he advocates. The booklets constitute two of the most readable publications of their kind that have come to the editor's desk. They are of the same size, 4 3/4 x 7 3/4 in. Pp. 20.

Motion Pictures on the Value of Fresh Air.

A motion picture entitled, "Health and Welfare Work," designed especially to promote better air conditions for industrial workers, has been brought out by the Ilg Electric Ventilating Co., Chicago, Ill. Portions of the film were made at the Ilg plant, as the studio of the Rothacker Film Mfg. Company, and at outside points where the proper settings could be secured.

The story told by the picture details the imperfect conditions resulting from improper venilation methods and this is followed by the improvements secured with corrected methods. For each individual condition where the lack of fresh air was pulling down the workman's health and production, the film shows the proper method of correcting the conditions. The picture also shows the profitable welfare work conducive to better health and increased production which it is possible to secure by small educational investments required to correct unhealthful conditions.

Included in the film are manufacturing processes carried on at the Ilg plant, "close up" views illustrating the manipulation of various machinery by workmen making Ilg products. There are also included views of employees participating in recreation and exercises, such as noon-hour entertainments, interdepartmental bowling matches, and a military training service.

Immediately upon completion the film was put in circulation on general health and welfare propaganda. It is being shown in theatres to impress the importance of fresh air, and is also being exhibited in schools, social centers and association meetings. In addition, the film is serving as illustrative sales lectures by the company's district managers. The film is given to dealers with the suggestion that it be offered to local theatres free of charge as an added attraction.

WANTED.

Electrical Engineer wanted in a consulting engineer's office in Ohio, experienced in making wiring layouts for power and lighting systems for industrial plants, also to assist in writing specifications and superintending construction. Address Electrical, care of Heating and Ventilating Magazine.

Wanted—By New York contractor, first-class heating and ventilating draftsmen. Address, giving age, salary and references, Box 12, care of Heating and Ventilating Magazine.

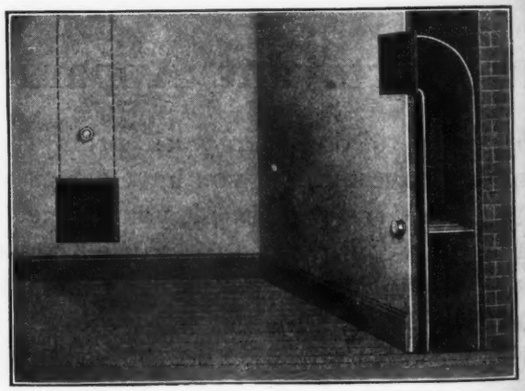
Wanted—Draftsman, familiar with building construction and laying out of piping. State experience, reference and salary wanted. Steady work. Address Walters, P. O. Box 168, Holyoke, Mass.

Wanted—Ambitious young man of 22 desires position with central station steam heating company in central State. Has five years' practical experience. At present has position as heating superintendent, but has excellent reasons for desiring a change. Address Marshall L. Williams, care Natrona Power Co., Casper, Wyo.

Wanted—High-grade engineers and draftsmen experienced in the design of heating and ventilating systems. Salaries range from $200.00 to $300.00 per month. In replying, state education, experience in detail, salary expected and earliest date you could report for work. Address Smith, Hinchman & Grylls, Architects and Engineers, 710 Washington Arcade, Detroit, Mich.

Controls Both Supply and Exhaust Air Ducts

PERFECTO DAMPER REGULATOR and INDICATOR



May be placed on the wall where the ventilating ducts are concealed and the damper connected to it by an extension of the square damper rod. Cannot be altered except by person in charge. Especially useful in schoolrooms.

This is one reason why the Perfecto Damper Regulator and Indicator is so widely used in school rooms.

Send for bulletin giving further particulars

THE SIXTH CITY SHEET METAL WORKS CO., Cleveland, O.

Galvanized Iron Work for Heating and Ventilating Systems